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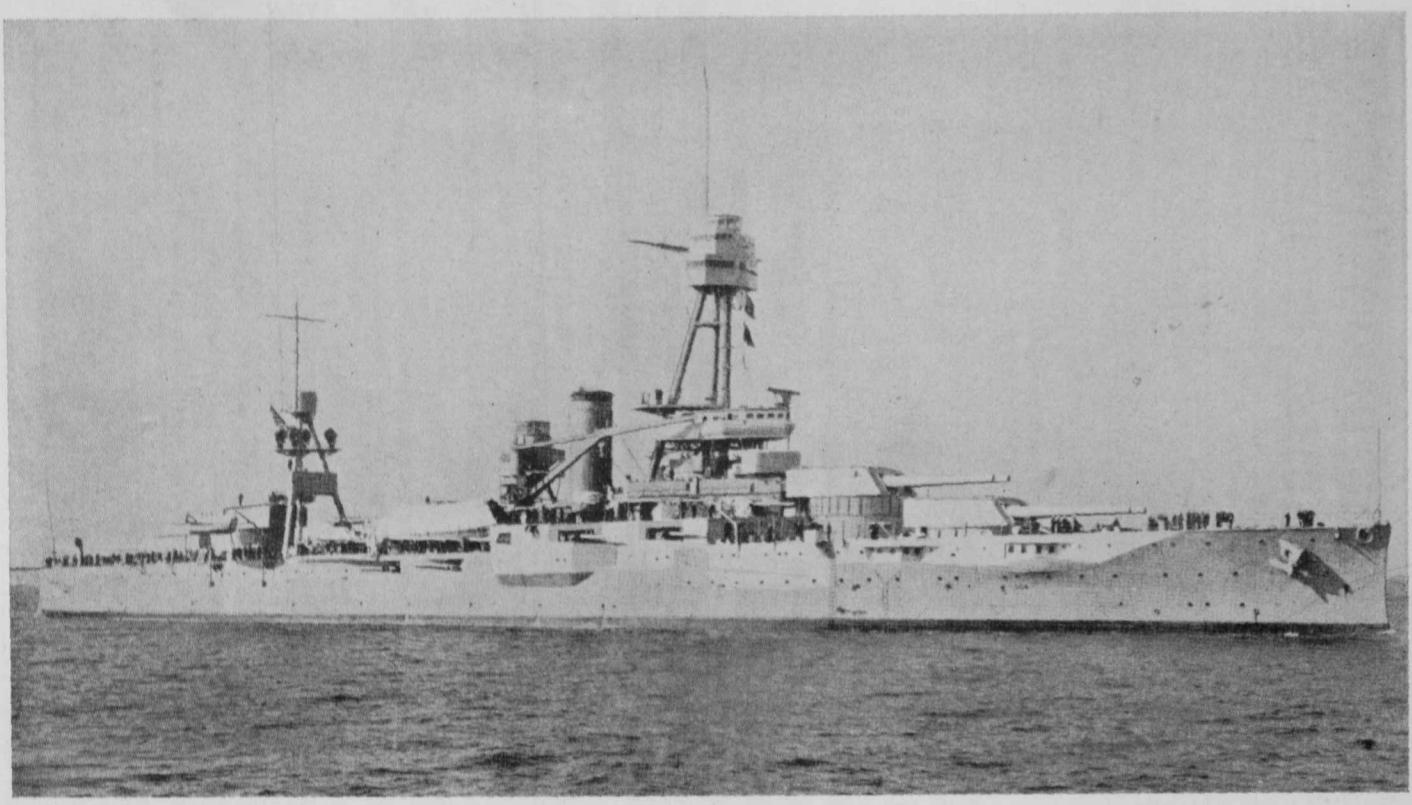

U. S. S. TEXAS

Length overall, 573 feet. Beam, 95 feet 2½ inches. Draft, mean 28½ feet. Displacement, full load, 28,367 tons. Guns: ten 14-inch, sixteen 5-inch, eight 3-inch AA. Armor: belt, 12 inches; turret, 14 inches; cunning tower, 12 inches; deck 3 inches (being increased.)

THE COAST ARTILLERY JOURNAL

Volume 67 NOVEMBER, 1927 Number 5

The Rotation of the Earth

By ROGER SHERMAN HOAR, *Major Ord. Res.*
(Formerly Captain, C. A. C.)

THE object of this article is to set down, and justify, a set of physical explanations of the effects of the rotation of the earth upon the flight of a projectile. This paper is the outcome of the work of the author as a member of the Ballistics Research Group at Marquette University in the spring of 1927.

It is axiomatic that a *mathematical* explanation of any physical fact should be, if correct, susceptible of a *physical* interpretation; and conversely that a *physical* explanation of any physical fact should be, if correct, susceptible of expression in rigorous *mathematical* terms.

In spite of the obviousness of the foregoing, every ballistics book or article which treats of the rotation of the earth keeps the physical explanation and the mathematical explanation in two water-tight compartments, and makes no attempt at deducing just what terms of the mathematical formulas represent each alleged physical effect. Furthermore, no set of physical explanations which I have yet seen printed is susceptible of reduction to the universally accepted Moulton formulas, which were rigorously and independently derived by several noted mathematical physicists and have never been disputed.

Therefore, it becomes the object of this article to evolve a set of physical explanations which will reduce to the Moulton formulas, term by term.

Dr. R. H. Kent, of Aberdeen Proving Ground, has suggested that the rotation of the earth affects the flight of projectiles through two physical laws. If these exhaust the Moulton formulas, this fact will prove that any other explanations are either alternative, or partially alternative, or incorrect.

His suggestion is that the rotation of the earth affects the flight of a projectile through: (A) the conservation of moments of momentum, and (B) the alteration of centrifugal acceleration by the azimuth of

fire. The object of this article is to test the correctness of that suggestion.

For purposes of considering either centrifugal acceleration or the conservation of moments of momentum, we must take into account the *absolute* velocity of the projectile in space, *i. e.*, the motion imparted to the projectile by the combination of the rotation of the earth and the explosion of the powder.

The (virtual) translation of the earth on its orbit, and the corresponding translatory motion of the projectile, can be disregarded by the well-known physical law that the translation of a system can have no internal effect thereon.

If it were possible, by means of some considerations of relative motion, to regard the gun as the center of rotation of the earth (as appears to have been done on page x of the introduction to the 1924 Ballistic Tables), the path of this assumed center of rotation would be a skew-spiral, and hence could not possibly be disregarded.

The Conservation of Moments of Momentum

The moment of momentum of a rotating system must remain constant, except so far as affected by some outside force. Assuming a constant mass, the moment of momentum is proportional to the product of the square of the radius of gyration (*i. e.*, the mean distance of all parts from the axis of rotation) and the angular velocity of rotation.

This moment of momentum must be conserved. The physical law involved is strikingly illustrated by a classroom demonstration frequently given at a certain German university. A student is stood upon the center of a turn-table, with his arms extended horizontally, and is rapidly rotated. Then he is directed to lower his arms suddenly to his sides. He does so, and thereby *decreases* to such an extent the average distance of the parts of his body from the axis of rotation, as to cause an immediate *increase* in his speed of rotation. This sudden increase in rate of spin causes him to lose his balance and fall to the floor in a most ludicrous manner, to the great delight of his fellow-students.

Now, what is true of a whole system is true of any one of its parts, to such extent as that part is unable to communicate motion to, or derive motion from, the rest of the system. Therefore, a projectile in flight must maintain a constant moment of momentum about the axis of the earth, except so far as retarded by atmospheric resistance, which retardation is a separable effect and hence can be, and is, treated separately.

During upward flight, the case of a projectile is the converse of that of the German student. As the distance of the projectile from the axis of the earth (which distance we shall call D) *increases*. the absolute angular velocity (which we shall call θ') of the motion of the projectile about the earth's axis *decreases* proportionally to the *increase* in D^2.

The symbol θ' should not be confused with the conventional ballistics symbol θ, which represents the inclination of a trajectory to the horizontal.

The law of the conservation of moments of momentum may be expressed by the formula: $D^2\theta'$ equals a constant. The value of that constant can easily be determined for the instant the projectile leaves the gun, and D is known for each instant of flight, thus giving us θ' for each point on the trajectory.

θ' is thus seen to vary in inverse ratio to the equare of the distance that the projectile is from the axis of the earth. Similarly $\theta' D$, representing the eastward component of the *absolute* horizontal linear velocity of the projectile, varies in inverse ratio to D.

But, in order to determine the motion of the projectile relative to the earth, we must remember that the projectile moves through a coordinate system which rotates with the earth. The absolute eastward horizontal linear velocity of this coordinate system varies in exact proportion to the distance from the axis of the earth. Thus, we have a projectile, the absolute eastward horizontal linear velocity of which is *inversely* proportional to the distance from the earth's axis, moving relative to a coordinate system, the absolute eastward horizontal linear velocity of which is *directly* proportional to the distance from the earth's axis. The result is that the projectile lags behind the coordinate system, and falls to the west of the spot where it would have fallen if the earth were motionless.

Centrifugal Acceleration

Centrifugal acceleration (or "centrifugal *force*" as it is more popularly called) is best illustrated by tying a stone on the end of a string, whirling it around one's head, and observing the outward pull on the string. The faster the motion, the stronger the outward pull on the string. The assumed value of g (*i. e.*, gravitational acceleration, or "attraction of gravity," as it is more popularly called), used in ballistics, takes into consideration the *average* centrifugal acceleration due to the earth's rotation.

Centrifugal acceleration equals the angular velocity squared times the radius of curvature. Therefore, the standard centrifugal acceleration, the average of which goes into the assumed value of *g*,—*i. e.*, so much of the centrifugal acceleration as is independent of the direction of fire—is $\Omega^2 D$, in which expression Ω is the angular velocity of rotation of the earth, 0.00007292 radians per second, and D is the perpendicular distance from the earth's axis to the projectile, the radius of the earth (R) having a mean value of about 6,367,000 meters.

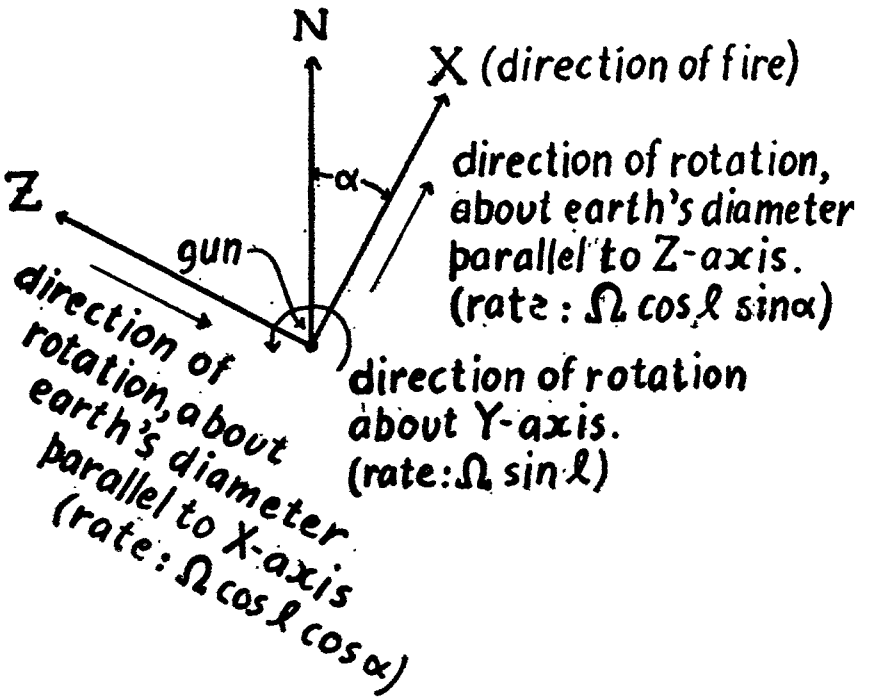

FIG. 1

But a projectile, fired due east, moves in a direction the same as that of the rotation of the earth, and thus has more tendency away from the earth's axis than does a projectile fired north or south. When the centrifugal acceleration is *greater* than normal, the projectile will go higher, will stay in the air a longer time, and will attain a *greater* range, than under the assumed standard conditions. Conversely, when the centrifugal acceleration is *less* than normal, the projectile will not go so high, will stay in the air a less time, and will attain a less range than under the assumed standard conditions.

Thus the *actual* angular velocity of the projectile's motion with respect to the axis of the earth, instead of being the Ω assumed in getting the mean value of g, is θ' as defined above, which will be more or less than Ω, according as the projectile is fired eastwardly or westwardly.

The foregoing completes the general discussion of the two physical effects of rotation of the earth. Let us now test them by applying them mathematically to a projectile, fired at a given latitude (l), in a given direction (α degrees clockwise from the north).

Compounding and Resolution of Rotations

By the principles of vector analysis, a rotation about any given axis can be resolved into rotations about any two or more other axes which lie in the same plane as the given axis and which intersect on the given axis. In other words, rotation-vectors can be resolved and compounded in the same manner as the more familiar force-vectors.

Thus, the actual rotation of the earth can be resolved into three rotations, as follows:

1. About a line through the earth's center, parallel to the Z-line. The effect of this rotation is as though the gun were firing east on the equator of a planet revolving at a rate of $\Omega \cos l \sin \alpha$.

2. About the Y-line. The effect of this rotation is as though the gun were on the north pole of a planet revolving at a rate of $\Omega \sin l$.

3. About a line through the earth's center, parallel to the X-line. The effect of this rotation is as though the gun were firing north on the equator of a planet revolving at a rate of $\Omega \cos l \cos \alpha$.

These three rotations are graphically shown in Figure 1, which represents the surface of the earth at the gun.

The resolution of the rotation of the earth into components was suggested to the author by Dr. Kent.

Let us now consider, on the actual earth, the effect of rotation in three analogous cases: (a) firing east at the equator; (b) firing south at the north pole; and (c) firing north at the equator.

Firing East at the Equator; Moment of Momentum

Figure 2 illustrates an equatorial section of the earth, viewed from the north. During any given time t, from the firing of the gun, the line joining the center of the earth and the gun will have rotated eastward through an angle Ωt. But, as the projectile itself has also been traveling eastward relative to this line during this interval, the line

joining the projectile and the center of the earth will have rotated eastward through a greater angle than Ωt, namely θ.

From that figure, it is clear that:

$$\theta' = \Omega + \frac{x'}{R} \qquad (1)$$

$$D = R + y \qquad (2)$$

The coordinate system is that defined on page 35 of *A Course in Exterior Ballistics* (W. D. Doc. 1051). Primes indicate time-derivatives.

The initial moment of momentum ($D^2_0 \theta'_0$) must be conserved,

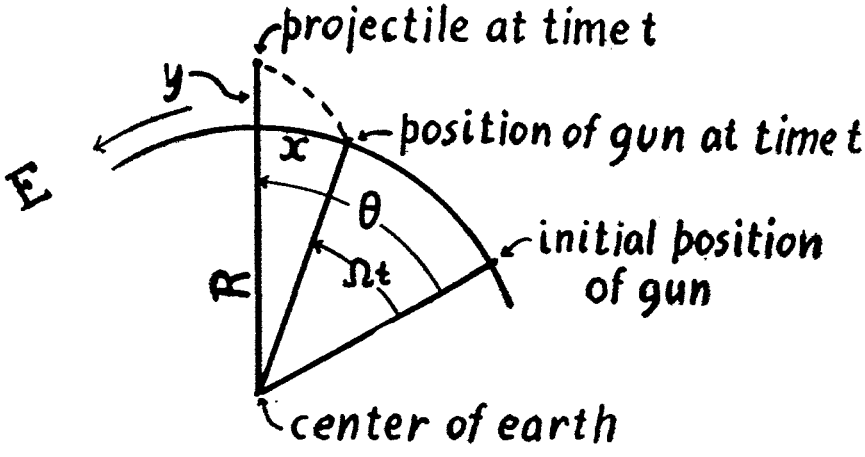

FIG. 2

except so far as diminished by atmospheric retardation, the effect of which is set up in the last term of equation 3.

We can express this principle as follows:

$$D^2 \theta' = D^2_0 \theta'_0 - \int_0^t \frac{(R + y)^2 Ex'}{R} \, dt \qquad (3)$$

From equation 3, we get, by a number of mathematical steps which will not be set out in detail in this article:

$$x'' = -2 \Omega y' \frac{R}{R + y} - \frac{2x' y'}{R + y} - Ex' \qquad (4)$$

Now Prof. W. E. Roth (1st. Lieut., F. A., Wis. Nat. Gd.), of the University of Wisconsin, has demonstrated, at the Marquette University

Ballistics Research Group of 1927, that the precise equations of motion of a projectile, in the curved coordinate system of modern ballistics, are:

$$x'' = -Ex' - \frac{2x'y'}{R+y}$$

$$y'' = -Ey' - g + x'^2 \frac{R+y}{R^2} \qquad (5)$$

See his article in the *Field Artillery Journal* for Sept.-Oct. 1927.

Therefore, when firing east on the equator, the effect of conservation of moments of momentum is equal to the difference obtained by substracting the first of equations (5) from equation (4), *i. e.*:

$$\delta x'' = -2\Omega y' \frac{R}{R+y} \qquad (6)$$

Firing East at the Equator; Centrifugal Acceleration

Let us now deduce the centrifugal acceleration effect of rotation of the earth upon a projectile fired east at the equator.

As we saw in the preliminary discussion, the centrifugal acceleration, when firing east along the equator, is $\theta'^2 D$.

Let g_a represent the attraction of gravity, without its centrifugal acceleration component. Then the actual vertical acceleration of the projectile is:

$$y'' = -Ey' - g_a + \Omega^2 D + 2\Omega x' \frac{R+y}{R} + x'^2 \frac{R+y}{R^2} \qquad (7)$$

In the second of equations (5), g is supposed to represent: $g_a - \Omega^2 D$. This assumption is flagrantly disregarded in modern ballistics; but at least it is the assumption on which trajectories are *supposed to be* computed.

The second of equations (5) can accordingly be rewritten:

$$y'' = -Ey' - g_a + \Omega^2 D + x'^2 \frac{R+y}{R^2} \qquad (8)$$

Therefore, when firing east on the equator, the effect of the change in centrifugal acceleration, due to the direction of fire, is equal to the difference obtained by substracting equation (8) from equation (7), *i. e.*:

$$\delta y'' = +2\Omega x' \frac{R+y}{R} \qquad (9)$$

Firing South at the North Pole, Moment of Momentum

Let us now deduce the moment of momentum effect of rotation of the earth upon a projectile fired south at the pole. Figure 3 illustrates the area about the north pole, viewed from above. As we do not yet know whether the rotation of the earth will cause a right-hand or a left hand deflection, we have drawn the Z-line in its positive sense, *i. e.*, to the left. From this figure we see that:

$$\theta' = \Omega + \frac{z'x - x'z}{x^2} \tag{10}$$

$$D = (R + y) \sin \frac{x}{R} = x \text{ (approximately)} \tag{11}$$

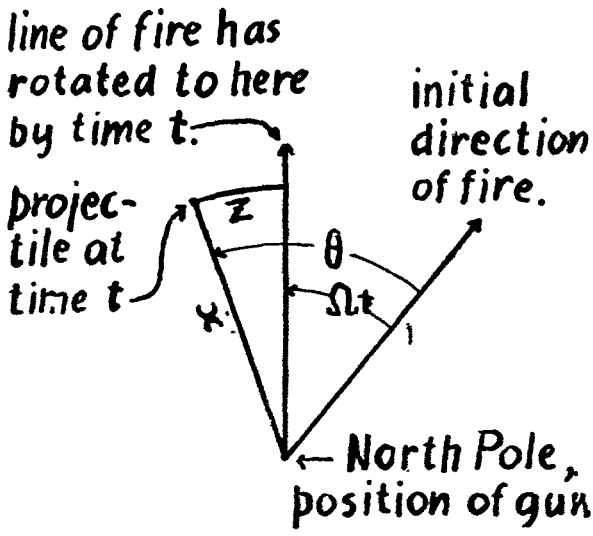

Fig. 3

Handling equations (10) and (11) as we did equations (1) and (2), we get, corresponding to equation (6), the following:

$$\delta z'' = -2\Omega x' + \frac{x''z}{x} \tag{12}$$

which can be expressed as sensibly:

$$\delta z'' = -x'\left(2\Omega + \frac{Ez}{x}\right) \tag{13}$$

The term Ez/x can be shown to be second-order as compared with 2Ω and so may be dropped, thus giving us:

$$\delta z'' = -2\Omega x' \tag{14}$$

If one wishes to be more rigorous, one can use $(R + y) \sin \frac{x}{R}$ in place of x throughout from equation (11) on; the result will be the same, plus utterly negligible terms.

Firing South at the Pole; Centrifugal Acceleration

At the pole, centrifugal acceleration is negligible, and therefore any variations in centrifugal acceleration, due to the negligible drift of the projectile, will be even more negligible.

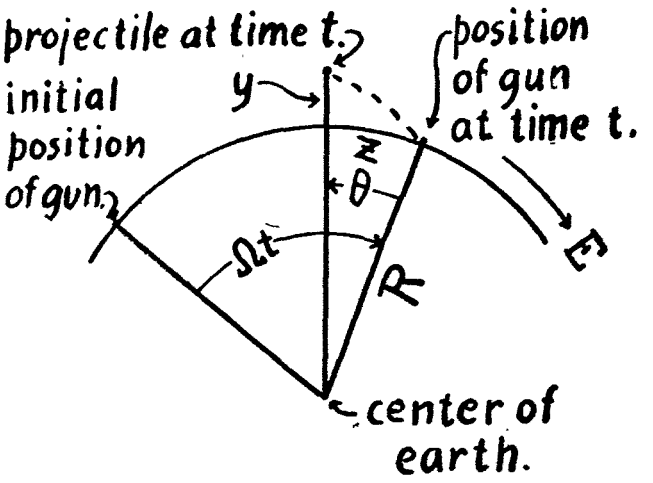

Fig. 4

Firing North at the Equator; Moment of Momentum

Figure 4 illustrates an equatorial section of the earth, viewed from the south. This figure is very nearly the reverse of figure 3, but differs from it in that $-z$ now takes the place of x, and the Z-line is drawn to the left.

The derivation of $\delta z''$, in the present situation, follows exactly the derivation of $\delta x''$ in equations (1) to (6), except that $-z$ takes the place of x throughout. Thus we get finally:

$$\delta z'' = +2\Omega y' \frac{R}{R + y} \tag{15}$$

Firing North at the Equator; Centrifugal Acceleration

Similarly proceeding on the analogy of equations (7) to (9), but substituting $-z$ for x throughout, we get:

$$\delta y'' = -2\Omega z' \frac{R+y}{R} \qquad (16)$$

But, as the deflection of a projectile is so small compared with its motion in the xy plane, that z' is negligible, this $\delta y''$ is likewise negligible.

Compounding the Results

It is now a simple matter to compound the results of these three cases, so as to get the rotation effect on a projectile fired at any latitude (l) in any direction (a).

Substitute $\Omega \cos l \sin a$ for Ω in equations (6) and (9). Substitute $\Omega \sin l$ for Ω in equation (14). Substitute $\Omega \cos l \cos a$ for Ω in equation (15). Add the results, getting:

$$\begin{aligned}
\delta x'' &= -2\Omega y' \frac{R}{R+y} \cos l \sin a \\
\delta y'' &= +2\Omega x' \frac{R+y}{R} \cos l \sin a \qquad (17) \\
\delta z'' &= +2\Omega y' \frac{R}{R+y} \cos l \cos a - 2\Omega x' \sin l
\end{aligned}$$

$\delta y''$ is due to the centrifugal acceleration effect. $\delta x''$ and $\delta z''$ are due to the moment of momentum effect.

To convert to the tangent-plane coordinate system employed by Moulton, multiply x', x'' and z'' by $R/(R+y)$. The result will be:

$$\begin{aligned}
\delta x'' &= -2\Omega y' \cos l \sin a \\
\delta y'' &= +2\Omega x' \cos l \sin a \qquad (18) \\
\delta z'' &= +2\Omega (y' \cos l \cos a - x' \sin l)
\end{aligned}$$

These results are identical to those obtained by pure mathematics by the Moulton method, and given as equations (90) on page 79 of *A Course in Exterior Ballistics*, except for algebraic signs. The fact that the origin of azimuths has been officially changed from south to north, and that the direction of the Z-axis has been officially changed from right to left, since that book was written, accounts for these differences in sign.

Therefore it follows that the two physical effects listed at the beginning of this paper are (if my mathematics based on them is

correct) the means, and the sole means, through which the rotation of the earth affects the flight of a projectile.

In the past, whenever a physical explanation of the rotation-effects was propounded, if the propounder had tested his proposition by reducing it to a mathematical formula and by then comparing this formula with Moulton, we should not have been favored with such divergent theories as are contained in the popular expositions on this subject.

The explanations most frequently given are as follows:

1. *Centrifugal Acceleration.* Rarely cited; but, when cited, usually given correctly. This is the case on page 76 of my own book, and on page 220 of Capt. Bennett's *Introduction to Ballistics;* but centrifugal acceleration is entirely overlooked in the introduction to the 1924 Ballistic Tables, in the report of the Coast Artillery Board in the May, 1923, *Coast Artillery Journal,* and in the 1925 edition of *Gunnery for Heavy Artillery.*

2. *The Lag Effect.* Always given *incorrectly.* For example, take the following from page 76 of my own book:

> The higher the projectile goes, the more must its velocity be altered, in order to maintain the same linear velocity relative to the earth.

Capt. Bennett, at pages 220-221 of his *Introduction to Ballistics,* the Coast Artillery Board in their report in the May, 1923, *Coast Artillery Journal,* the 1925 edition of *Gunnery for Heavy Artillery,* page 13, and the 1924 Ballistic Tables, page x, give a similar erroneous explanation of lag, laying it merely to difference in horizontal velocity. Such an explanation reduces to a mathematical expression which is exactly *one-half* of the *true* expression.

3. *Inclination of Axes.* So called in *Gunnery for Heavy Artillery.* Capt. Bennett calls this the "geometrical" effect. It stands to reason that, as lag and centrifugal acceleration exhaust Moulton's formulas, which are universally conceded to be correct, any third effect must be either entirely unfounded, or else the equivalent of the whole or of a part of one or both of the other two.

This alleged "geometrical" effect is explained in detail on page 472 of the May, 1923, *Coast Artillery Journal,* on page 219 of Bennett, on page xi of the 1924 Tables, and on page 14 of *Gunnery for Heavy Artillery.*

The report of the Coast Artillery Board and *Gunnery for Heavy Artillery* both state that the base of the trajectory tips up and meets a projectile fired west, thus shortening the range.

Bennett's explanation is similar but more involved. He uses a "mean horizontal plane" for his datum, and speaks of this plane as tipping up and meeting the projectile.

But the datum plane of modern ballistics is the curved surface of the earth.

Therefore it is clear that the rotation of the earth does not cause *this* datum plane to tip up and meet the projectile. Yet the introduction to the 1924 Ballistics Tables attempts to apply the same explanation even to this curved datum, stating:

> The earth comes up and meets the projectile and shortens the range . . . The rising of the western horizon makes the sun appear to set and the lowering of the eastern horizon makes the sun appear to rise.

This is not on apt analogy, for we are concerned with what *actually* happens to the projectile, rather than with what *appears* to happen to it.

This alleged geometrical effect is clearly inconsistent with the modern convention of ballistic coordinates. Therefore we may assume its nonexistence, even under the tangent-plane cartesian coordinates of Ingalls-Siacci; for a mere adoption of some particular sort of coordinates cannot create a *physical* condition which would not otherwise exist.

4. *Change of Azimuth.* This is correctly stated on page xi of the 1924 Ballistic Tables, on page 479 of the May, 1923, *Coast Artillery Journal,* and on page 15 of *Gunnery for Heavy Artillery.* This is solely a deflection effect, and was shown in equations (10) to (14) to be a *lag* effect, due to the conservation of moment of momentum.

5. *A Term in Deflection Similar to Cant.* This appears nowhere save on page xi of the 1924 Ballistic Tables. It is merely an incorrect attempt to explain what is really the z-component of item 2, lag.

Conclusions

Item 1 (centrifugal acceleration) plus item 2 (lag effect) contain all that is necessary to explain the results of the rotation of the earth. Of course, item 2 should be correctly stated as due to conservation of moment of momentum, and should include, as a lag effect, item 4 (change of azimuth). Item 3 (inclination of axes, or geometrical effect) and item 5 (a term in deflection similar to cant) are unfounded.

Conservation of the moment of momentum of the projectile with respect to the earth's axis, and the effect of the direction of fire upon the centrifugal acceleration of the projectile, can therefore be considered as the true and only means through which the rotation of the earth sensibly affects the flight of a projectile.

Campaign Against Forts Henry and Donelson, February, 1862

By COMMITTEE No. 6, *C. A. S., 1926-27*

I. GENERAL SITUATION

FROM the time war was declared between the North and the South until September, 1861, Kentucky remained neutral. There was considerable sentiment within the State for both sides. Both Confederates and Federals tried to gain support of the State. As time went on the sentiment of the State Legislature inclined more and more to the side of the North.[1]

The first violation of the neutrality of Kentucky was a movement on September 3, 1861, of a force under General Leonidas Polk to occupy Columbus.[2] This act was followed on September 5, 1861, by a force under General U. S. Grant of two infantry regiments and a company of light artillery moving from Cairo to occupy Paducah.[3]

Additional troops were added by both sides until, at the end of 1861, each side had forces as follows:

FEDERALS[4]—In the Department of Ohio, about 45,000 men under General Buell. The Department of the Ohio included that part of Kentucky east of the Cumberland River.

In the Department of Missouri, about 25,000 men under General Halleck. This Department included that part of Kentucky west of the Cumberland River.

At Cairo, a fleet of ironclads under Commodore Foote.

CONFEDERATES[5]—Some 40,000 men under General Albert Sidney Johnston holding a line from Bowling Green to Columbus as follows:

At Columbus, 12,000 effectives under General Polk.

At Bowling Green, 22,000 effectives under General Johnston.

At Forts Henry and Donelson, between 5000 and 6000 men under General Tilghman.

Before the campaign started General Beauregard left Manassas on January 26, 1862, with 15 regiments, for Bowling Green.[6]

NOTE: Wherever *American Campaigns*, Vol. 1, by Steele is used as a reference, it will be referred to as Steele. *American Campaigns*, by Tenney, will be referred to as Tenney. *Rebellion Records*, Series 1, Vol. 7, Serial No. 7, will be referred to as RR.

[1] Steele, 150; *Encyclopedia Britannica*, XV, 747.
[2] Steele, 150; Tenney, 94.
[3] Steele, 150; Tenney, 94.
[4] Steele, 151; Tenney, 98, 120.
[5] Steele, 150; Tenney, 98, 120.
[6] RR, 121, 122.

Topographical Features Which Influenced Operations.[7]—Running southeast from the Ohio River are the Tennessee and Cumberland Rivers, passing through the Western part of Kentucky. The Tennessee is navigable through Kentucky and Tennessee and as far as Muscle

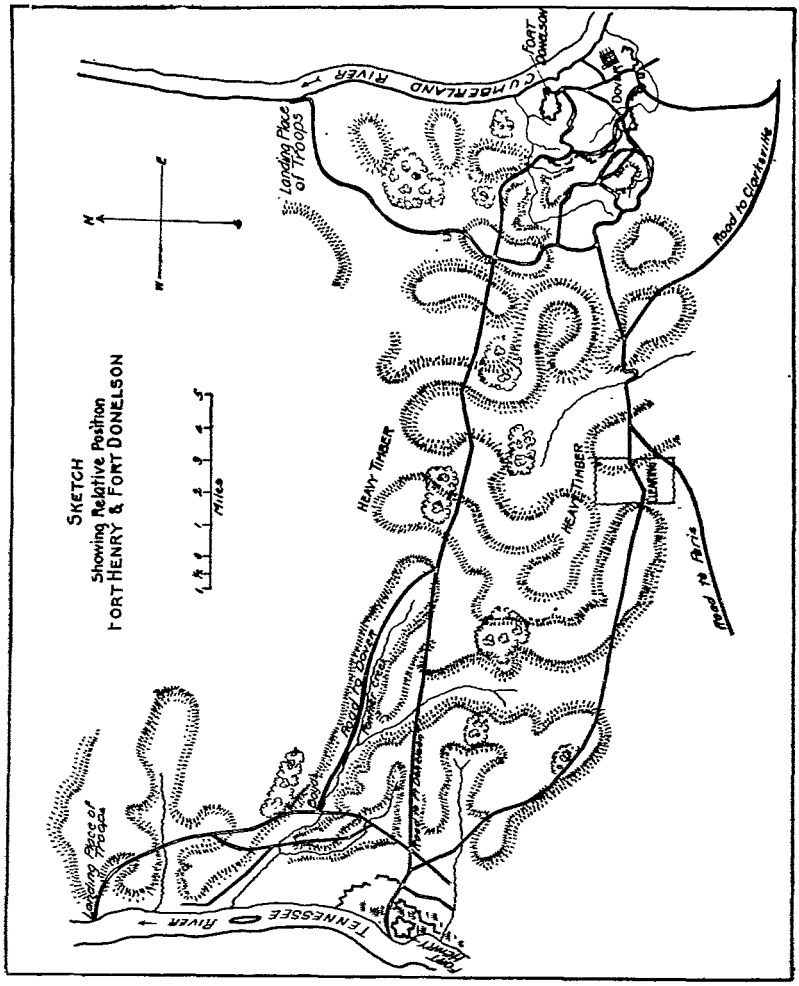

FIG. 1

Shoals in Northern Alabama. The Cumberland is navigable as far as Nashville.

These rivers are not far apart in Kentucky and Northern Tennessee. Between Fort Henry and Fort Donelson the distance is only

[7] Steele. 151: Steele, *American Campaigns*, ii. 73.

eleven miles. It will be noticed that these forts are both in Tennessee. Further north, in Kentucky, the distance in one place is only about four miles between rivers. This place would have been a better location for the forts commanding the rivers, but the forts were built while Kentucky was still neutral.

There was at this time quite a complete network of railroads running through Tennessee and into the other Southern states. There were important railroad centers at Chattanooga, Memphis, Nashville, Bowling Green, Paris, Humboldt, and Columbus. All of the points occupied by the Confederates were connected to each other by railroad. The distance from Bowling Green, the right of the Confederate line, to Columbus, the left of the line, is about one hundred seventy miles by rail.

The two rivers, the Tennessee and Cumberland, passed right through the heart of this network of railroads.

The roads in Kentucky and Tennessee at this time were for the most part ordinary dirt roads, fairly good when they were dry, but nearly impassable in winter and spring when they were wet.[8]

Plans Open to the Federals.[9]—General Buell wanted General Halleck to make a holding attack against the Confederate line via the rivers while he, with the main force, made the main effort around the Confederate right flank, moving on Bowling Green and Nashville.

General Halleck proposed moving up the rivers in force to attack Bowling Green and penetrate the Confederate line. This necessitated the reduction of Forts Henry and Donelson.

Due to the bad terrain over which an enveloping attack on the Confederate right flank would have to operate this plan was abandoned in favor of the penetration.

Before this plan was put into operation, Commodore Foote made a reconnaissance and, in conjunction with General Grant, recommended that his fleet of gunboats be allowed to take part in the campaign.[10]

Plans Open to the Confederates.[11]—General Johnston could either fall back or hold the line he was occupying. This last was very important, for while he held the line he was on he protected the network of railroads in his rear. He decided to hold.

II. Federal Operations Against Forts Henry and Donelson

Operations Against Fort Henry.—General Grant, in compliance with instructions from General Halleck,[12] with an expedition of 17,000 men and Flag Officer Foote's ironclads, started to ascend the Tennessee River on February 2, 1862[13] to attack Fort Henry.

[8] Steele. 152; RR, 125.
[9] Steele. 152; Tenney. 124.
[10] Tenney, 124; RR, 120-121.
[11] Steele. 153; RR, 131.
[12] RR, 121; Tenney, 125.
[13] RR, 126; Tenney, 125.

The concentration of General Grant's forces, consisting of the 1st Division, 2d Division, and Flag Officer Foote's fleet, was completed during the night of 5-6 February.[14] The 1st Division, General McClernand, and the 3d Brigade, 2d Division, were concentrated at Bailey's Landing, four miles below Fort Henry, and the 2d Division, less the

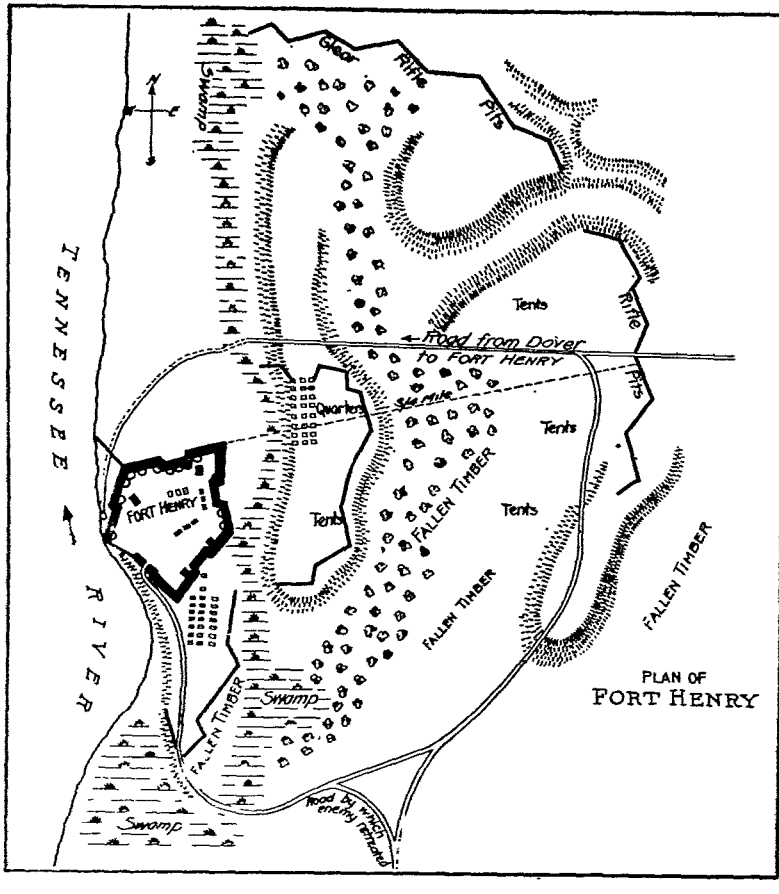

FIG. 2

3d Brigade, General C. F. Smith commanding, on the west bank of the Tennessee opposite Bailey's Landing.[15]

About 11:00 A. M., 6 February, the combined forces of General Grant and Flag Officer Foote moved to attack Fort Henry.[16] The 1st Division, General McClernand, moved to take a position on the roads from Fort Henry to Fort Donelson with the special duty of preventing

[14] RR, 128; Tenney, 125. [15] RR, 125, 128. [16] RR, 125, 129.

reenforcement of Fort Henry, or escape from it, and also to be held in readiness to charge and take Fort Henry by storm promptly, on orders from General Grant.[17]

The 3d Brigade, 2d Division, was to advance up the east bank of the Tennessee River as fast as possible, with security, and be in readiness to charge upon Fort Henry or move to the support of the 1st Division.[18]

The 2d Division, less the 3d Brigade, General C. F. Smith commanding, moved by the west bank of the Tennessee River to take and occupy the heights commanding Fort Henry from that bank of the river.[19]

The fleet moved up the Tennessee under Flag Officer Foote, with the ironclad gunboats *Cincinnatti, Essex* (Flagship), *Carondelet,* and *St. Louis* forming the first division, and the old gunboats *Conestago, Tyler,* and *Lexington,* the second division.

The armed boats of the first division were placed in the first order of steaming, approaching the fort in a parallel line while the second division took position astern and inshore of the armed boats.[20]

The fleet opened fire on Fort Henry at 12:30 P. M. at a range of 1700 yards,[21] and gradually closed to 600 yards, the fire from the fort and gunboats increasing in rapidity and accuracy as the gunboats closed on the fort.[22]

The action between the fort and the fleet continued until 1:45 P. M. when the flag on the fort was lowered,[23] and shortly afterward General Tilghman surrendered Fort Henry to Flag Officer Foote aboard his Flagship.[24]

At 1:25 P. M. the ironclad *Essex* received a shot in her boilers which entirely disabled her and put her out of the fight.[25]

The Federal troops were so much delayed in their operations by the high water and muddy roads that the Confederates had time to make good their retreat to Fort Donelson.[26] General Tilghman and about eighty prisoners, the fort with twenty heavy guns, a large amount of stores, and everything belonging to the Confederate garrison were captured.[27] Losses to the Federals consisted of the total disabling of the ironclad *Essex.*[28] Casualties in the fleet were two men killed and nine wounded with twenty-eight injured by the boiler explosion on the *Essex.*[29] Confederates casualties were five killed and ten wounded.[30]

Operations Against Fort Donelson.—General Grant left Fort Henry on 12 February with a force stated by him as "about 15,000 men," divided into two divisions under the command of Generals McClernand

[17] RR, 125, 128.
[18] RR. 125, 128.
[19] RR, 125, 128.
[20] RR, 122; Tenney, 127.
[21] RR, 122, 134.
[22] RR. 122. 141.
[23] RR. 122, 142.
[24] RR. 123. 142.
[25] RR, 122, 123. 125.
[26] RR. 129; Geer. *Campaigns of the Civil War,* 127.
[27] RR, 124, 125; Tenney, 127.
[28] RR, 123; Tenney, 127.
[29] RR. 123; Tenney, 127.
[30] RR. 142; Tenney, 127.

and C. F. Smith.[31] Six infantry regiments, convoyed by a gunboat[32] moved down the Tennessee and ascended the Cumberland River arriving below Fort Donelson with Flag Officer Foote's fleet on the evening of 13 February.[33] The divisions of Generals McClernand and Smith arrived within two miles of Fort Donelson at 12:00 o'clock 12 February[34] and during the afternoon the Confederate works were gradu-

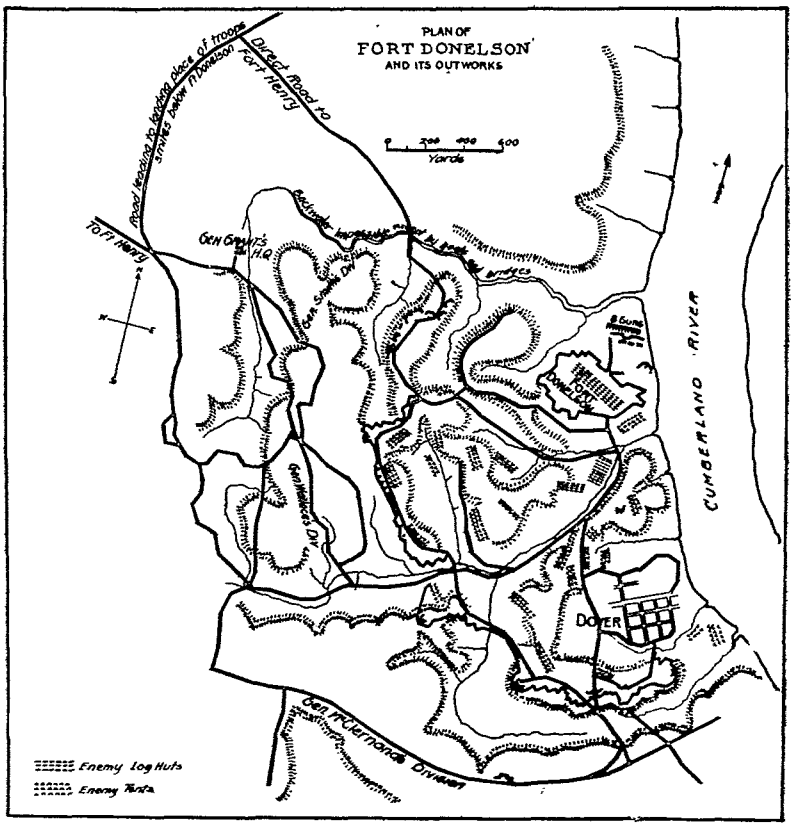

FIG. 3

ally approached and surrounded, with occasional skirmishes on the line.[35] Active skirmishing took place on the 13th with the Federal troops extending their forces around the Confederate flanks and pushing their lines closer to the Confederate works.[36]

At 3:00 P. M., 14 February, Flag Officer Foote made an attack on Fort Donelson with four ironclads and two wooden gunboats and dur-

[31] RR, 159; Tenney, 129.
[32] RR, 159; Tenney, 129.
[33] RR, 159; Tenney, 129.
[34] 170; Tenney, 129.
[35] RR. 171; Tenney, 129.
[36] RR. 172. 194.

ing the action closed to within 400 yards of the Confederate batteries. Two of the armed boats received injuries, from enemy fire, which made them unmanageable in the swift current of the river and they drifted down stream followed shortly by the remainder of the fleet, all of

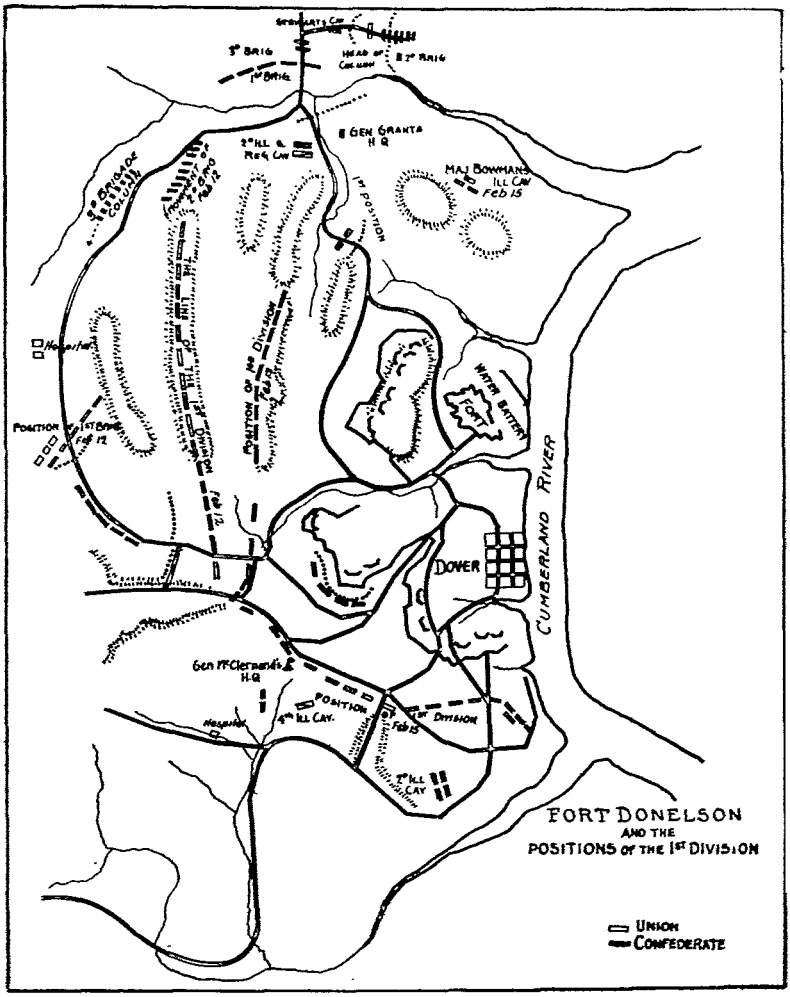

FIG. 4

which had received serious injury during the action. The engagement lasted one hour and thirty minutes.[37] Flag Officer Foote's report to the Secretary of the Navy showed a loss on the fleet of 10 killed and 40 wounded.[38]

[37] RR, 166, 262,268.

[38] RR, 166, 167, 268.

During the night of 13-14 February the Federals brought up a full division under General L. Wallace, and 2500 additional troops from Fort Henry to reenforce the lines.[39] General Wallace's Division, the 3d, was placed in the center of the line, with the 1st Division, General McClernand, on his right, and the 2d Division, General C. F. Smith, on the left.[40]

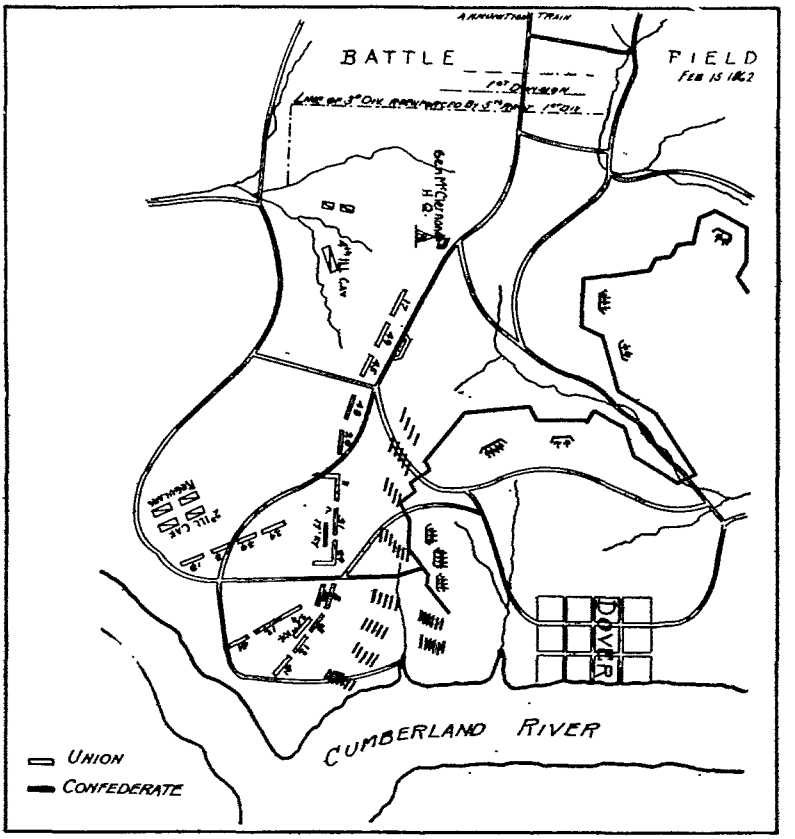

FIG. 5

During the 14th of February only skirmishing took place between the opposing land forces with the Federal troops continuing to extend their lines further around the Confederate's left flank to the southeast of the Charlotte Road and north of the Wynns Ferry Road.[41]

At 5:00 A. M., 15 February, the Confederates launched an attack against the right of the Federal line (McClernand's 1st Division) and

[39] RR. 236; Grant. *Memoirs*, i. 294.
[40] RR. 176, 236.
[41] RR. 174, 175, 262, 263.

by 1:00 P. M. had driven the 1st Division to the northeast in confusion and secured the road to Nashville.[42]

General L. Wallace sent Thayer's Brigade to support McClernand's 1st Division, and by 1:00 P. M. the Confederate advance had been stopped, but not until the 1st Division had been driven to the northwest about two miles and approximately to the position it occupied on the morning of the 13th.[43]

General Grant, who had been absent from the field consulting Flag Officer Foote aboard his flagship[44] arrived on the field about 1:30 P. M. and gave orders to General Smith with his 2d Division to attack the Confederate right and to Generals McClernand and Wallace with the 1st and 3d Divisions to attack and regain the ground lost on the right during the morning.[45]

General C. F. Smith with the 2d Division attacked the Confederate position directly in his front and to the west of the fort at about 2:00 P. M., and by dark had succeeded in gaining possession of part of the entrenchments which he held until the surrender on the morning of the 16th.[46]

General L. Wallace with the 3d Division attacked the Confederate left at 3:00 P. M. and supported by five regiments of the 1st Division drove the Confederates within their works and recaptured the ground lost in the morning engagement.[47] The ground captured by the 3d Division was held by them until the surrender of the fort on the morning of the 16th.[48]

Early on the morning of 16 February, after an exchange of notes between General Buckner and General Grant, Fort Donelson was unconditionally surrendered to the Federal forces.[49]

III. Confederate Operations

Fort Henry, in February, 1862, was a bastioned work covering about ten acres in which were mounted seventeen guns, twelve of which were placed to bear on the Tennessee River.[50] The fort was below water level and was commanded by high ground on both sides of the river.[51] Fort Heiman, on high ground on the left bank, had been recently constructed. On the right bank the fort was protected from land attack, from the east, by strong infantry works thrown up on commanding ground to the east.[52]

The forces occupying Forts Henry and Heiman, under General Lloyd Tilghman, numbered about 2500 officers and men, and 75 heavy artillerymen.[53]

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[42] RR, 263, 282.
[43] RR, 237, 263.
[44] RR, 176; Grant, *Memoirs*, i. 294.
[45] RR, 163, 238.
[46] RR, 165, 283.
[47] RR, 238, 283.
[48] RR, 180, 239.
[49] RR, 160, 335.
[50] RR, 132; Steele, 154.
[51] RR, 132; Steele, 154.
[52] RR, 132; Steele, 154.
[53] RR, 137; Steele, 155.

When the fort was fired on at about noon, 4 February, by the Federal gunboats, General Tilghman was absent at Fort Donelson preparing it for defense.[54] Upon General Tilghman's return he found that the enemy was landing troops in considerable numbers at Bailey's Ferry, three miles below, and that Colonel Heiman, who had been left in command, had pushed forward scouting parties and had thrown forward to the line of outworks two field pieces covering the route to Dover.[55] Only thirty minutes of fire had been participated in by the heavy guns of the fort.[56]

On the morning of 5 February, General Tilghman withdrew practically all the troops from Fort Heiman.[57] Troops were formed into two brigades and each brigade assigned its position on the outworks.[58] General Tilghman, his staff, and about 70 men, to man the guns, remained in the fort.[59] Everything was made ready to resist an enemy attack.[60] Two regiments from Fort Donelson, under Colonel Head, were made ready to give assistance on call.[61]

On the morning of 6 February troops were paraded and marched to their positions in the outworks, leaving only the men manning the batteries within the fort.[62]

The Henry batteries returned the fire of the gunboats a few moments after the Federals shelled the fort.[63] The shelling continued for over an hour, during which time the Confederates lost the use of five guns and five men killed.[64] By this time the troops were becoming discouraged and exhausted[65] and General Tilghman and other officers assisted in manning the guns in an effort to continue the fight.[66]

Upon the urgent request of his officers, General Tilghman finally decided to surrender. He directed Colonel Heiman, who had returned to the fort for orders, to withdraw the troops in the outworks and retreat to Fort Donelson.[67] General Tilghman, with his staff and the men manning the guns of the fort, remained to do all possible to cover the retirement of his main body before he surrendered.[68]

The retreat was made in much disorder and, although pursued for a short time, the entire force, except a few guns, vehicles, stores, and 22 men, reached Fort Donelson at 2:00 A. M., 7 February, after a march of 22 miles over water soaked roads.[69]

General Tilghman, his staff, and about 70 men surrendered to Commodore Foote at 1:55 P. M., after a terrific bombardment which had lasted over two hours.[70]

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[54] RR, 133; 137.
[55] RR, 133, 150.
[56] RR, 149.
[57] RR, 138, 150; Steele, 155.
[58] RR, 133, 150.
[59] RR, 133, 151.
[60] RR, 133, 138.
[61] RR, 138, 151.
[62] RR, 140, 151.
[63] RR, 134, 151.
[64] RR, 134, 142.
[65] RR, 134.
[66] RR, 134, 147.
[67] RR, 134, 152.
[68] RR, 134, 152.
[69] RR, 147, 152.
[70] RR, 142.

Fort Donelson in February, 1862, was a bastioned parapet irregular fort, 100 feet above the river and covered about 100 acres. It was on the west bank of the Cumberland River just north of Dover, Tennessee.[71] In addition to the main fort, infantry trenches had been constructed on the summit of the hills to the west to protect the fort from land attacks.[72]

On 13 February the entire garrison consisted of about 15,000 men under command of Brigadier General Pillow and later under Brigadier General John B. Floyd.[73] The troops were in the trenches and at the batteries prepared to meet the advancing enemy.[74]

General Pillow's Division (under command of Brigadier General B. R. Johnson) was assigned the left of the line and Brigadier General Buckner's the right.[75]

On the morning of the 13th the Federal artillery and infantry opened fire on the trenches and continued throughout the day.[76] Several assaults on the right of Pillow's Division were repulsed vigorously.[77] The artillery did very effective work in assisting the repulse of these assaults.[78] That night the troops remained in position along the lines.[79]

The 14th was very quiet until about 3:00 P. M., when the water batteries became heavily engaged with the Union gunboats and after about an hour's engagement drove them off.[80] All accounts agree that *this ended the attacks by gunboats.*[81]

That evening it was learned that the enemy had landed a large number of reinforcements and had completely surrounded the Confederate forces cutting off all avenues of retreat.[82]

Generals Floyd, Pillow, and Buckner met in council and it was decided to attack the enemy's extreme right and right center and drive him back, in order to gain possession of the road via Charlotte to Nashville.[83] Lieutenant Colonel Gilmer, who was present at this council of war, states that, "It was hoped even greater advantages might be gained, which if followed up on our part, would result in disaster to the invaders."[84] The plan adopted was: That General Pillow's forces were to make the main attack on the right flank of the enemy position; that General Buckner's forces, after being relieved on the right of the line by two regiments, were to attack the right center and take up a

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[71] Steele, 156.
[72] RR, 267; Steele, 156.
[73] RR, 267; Steele, 156.
[74] RR, 262, 279.
[75] RR, 279; Steele, 157.
[76] RR, 262, 330.
[77] RR, 279, 330.
[78] RR, 330; Steele, 157.
[79] RR, 262, 268.
[80] RR, 263, 268; Steele, 157.
[81] RR, 263, 268, 281.
[82] RR, 281; Steele, 158.
[83] RR, 263, 281, 331; Steele, 158.
[84] RR, 263, 265.

position astride the Wynn's Ferry Road to cover the retreat of the forces and later to act as the rear guard; and that Colonel Heiman was to hold his position in the center.[85]

The movement into positions was made during the night.[86]

At 5:00 A. M., 15 February General Pillow assaulted, assisted by Colonel Forrest's cavalry brigade.[87] General Buckner, although delayed, soon came up on Pillow's right.[88] In about thirty minutes both sides were well engaged and Colonel Gilmer states that it was necessary to send a body of troops under General B. R. Johnson to the extreme left to check a flanking movement by the enemy.[89] After about two hours the enemy's right wing was turned slowly and stubbornly.[90]

Finally the enemy was in full retreat and Forrest's cavalry charged its right and rear, capturing six field pieces.[91]

By 12:00 Noon General Pillow was in possession of ground recently held by Union troops[92] and Buckner's forces had come up in position astride the Wynn's Ferry Road to cover the withdrawal.[93]

About this time the enemy received reinforcements and checked his pursuit.[94] General Pillow ordered the victorious troops to return to the defensive lines.[95] General Buckner, when he arrived in his position on the right, found the enemy advancing but, after a stubborn fight, drove him back to the trenches on the extreme right of the Confederate line.[96] Even at this time no effort was apparently made to withdraw the troops and save the army, although one road still remained open.[97]

That night another council of war was held and it was decided to surrender.[98] It had been learned, by this time, from a reconnaissance made by Forrest, that the Union troops completely surrounded the fort.[99] Generals Floyd and Pillow refused to surrender themselves, so they turned the command over to General Buckner for him to surrender and they escaped.[100] Colonel Forrest and his command also escaped.[101]

On the morning of the 16th General Buckner ordered the troops back into the trenches and dispatched a note to General Grant requesting an armistice until 12:00 Noon, and the appointment of a commission to agree to terms of capitulation.[102]

General Grant refused General Buckner's request so General Buckner surrendered immediately and unconditionally.[103]

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[85] RR, 263, 282, 331; Steele, 158.
[86] RR, 277, 234; Steele, 158.
[87] RR, 263, 282; Steele, 158.
[88] RR, 231; Steele, 158.
[89] RR, 263.
[90] RR, 263, 282; Steele, 159.
[91] RR, 263, 282; Steele, 159.
[92] RR, 282; Steele, 159.
[93] RR, 263; Steele, 159.
[94] RR, 263; Steele, 159.
[95] RR, 264; Steele, 159.
[96] RR, 264, 283; Steele, 160.
[97] Steele, 160.
[98] RR, 264; Steele, 160.
[99] RR, 333; Steele, 160.
[100] RR, 334; Steele, 161.
[101] RR, 285; Steele, 161.
[102] RR, 160, 335.
[103] RR, 161, 335.

IV. Comments

Credit for the plan of the expedition to Forts Henry and Donelson has been variously bestowed. Halleck, Buell, and Grant have all been awarded the honor by various historians. However, it appears that the necessity for control of the Cumberland and Tennessee Rivers, as well as the Mississippi and Ohio, was understood by Fremont, who on August 24, 1861, ordered the construction of certain gun and mortar boats.[104] The immediate scheme of an advance on Fort Henry seems to have originated with Grant and Foote.[105] Buell's plan was for Halleck to ascend the Cumberland and Tennessee Rivers while he himself advanced south toward Bowling Green with Nashville as his objective.[106] Halleck objected to this arrangement and wanted the bulk of Buell's army turned over to him for an advance up the Cumberland while Buell with a small force contained Johnston at Bowling Green.[107] McClellan would not approve either plan but kept urging Buell to advance into east Tennessee.[108]

On January 29, 1862, Halleck got word from Washington that Beauregard was on his way to Kentucky with fifteen regiments.[109] On the 30th he ordered Grant to take and hold Fort Henry with the least possible delay and ordered Foote to support the move.[110]

The attack on Fort Henry was made on February 6 and was successful due largely to the faulty location of the fort and its guns, the powerful bombardment by the Federal gunboats, and the insufficiency of the garrison, most of which retreated to Fort Donelson before the surrender.[111]

After the fall of Fort Henry, Grant and Foote moved on Fort Donelson and invested it.[112] On 16 February it surrendered.[113] So much for a summary of the main events of the campaign.

At the opening of the campaign, Johnston had the advantage of interior lines and could have concentrated more quickly than either Halleck or Buell. After the fall of Fort Henry, instead of sending half his force to Fort Donelson under an incompetent general, he should have left the smallest possible containing force in front of Buell and marched himself with all the rest of his army against Grant. By his action Johnston violated the principle of mass.

General Floyd upon his arrival at Fort Donelson shut himself and his troops up inside the works with no line of retreat secured[114] and

[104] B. & L., 284; Tenney, 119.
[105] RR, 120, 121.
[106] RR, 451.
[107] RR, 510 (Ser. I, Vol. VIII).
[108] RR, 447, 457 (Ser. I, Vol. VIII).
[109] RR, 122.
[110] RR, 121.
[111] RR, 123, 124, 133, 134.
[112] RR. 159, 161.
[113] RR, 256, 161.
[114] RR, 267, 268.

remained supine during the 13th of February when he should have vigorously attacked Grant before the latter concentrated his command and completed his investment of the fort. In this instance Floyd violated the principle of the offensive.

Again on the 15th, after the Confederate effort against the Federal right had opened up a line of retreat, Floyd failed to take advantage of the opportunity thus created.[115] At this point, which was the crisis of the campaign, either one of two lines of action would have been right: to have gone ahead and marched to Nashville as planned, or to have brought his whole strength against the Union right and thus have completed the victory so well begun. Instead, Floyd listened to both Pillow and Buckner and ended by doing neither, but ordered his whole victorious left wing to return to their trenches.[116]

On the night of the 15th Floyd, accompanied by some of his troops, made his escape from Fort Donelson by boat[117] in which instance he violated one of the first principles of soldierly conduct, although he observed the first law of nature. A study of this campaign fails to reveal that General Floyd did anything right.

General Pillow, who succeded to the command at Fort Donelson after the fall of Fort Henry, spent February 12 in digging intrenchments during the Federal march from Fort Henry[118] instead of striking Gran't troops in flank while on the march, as a bold and skillful commander would have done. This was his first mistake and violated the principle of the offensive. Later, on the 15th, after his successful effort against the Federal right before Donelson, he assumed unwarranted authority, ordered Buckner back to the right of the line and threw away the advantage gained.[119]

Pillow, and later Floyd, failed to observe the principle of movement. Their proper course was to maneuver so as to draw Grant away from the fort; instead they allowed themselves to be beleagured therein.

It might be said in this connection that if a defense of Fort Donelson from inside its works was the Confederate plan, then the sortie on February 15 was an error. The Confederate batteries had successfully repulsed Foote on the 14th, and by the accuracy of their fire had rendered his fleet so unserviceable that further operations by water had to be indefinitely postponed.[120] It is conceivable that the rebel force might have withstood successfully a short siege and thus have given Johnston an opportunity to come to their support. At least, they could have made shift to have saved a reasonable proportion of their force. Moreover, the weather was in their favor and there does not seem to

[115] RR. 269, 327, 332, 333.
[116] RR, 333. 269.
[117] RR. 270. 290.
[118] RR. 279. 329.
[119] RR. 282, 332.
[120] RR, 166, 167.

have been any real reason for surrendering such an extensive work except as a last resort. The passage from the defensive to the offensive and again to the defensive all within the space of some twelve hours was like trying to change horses not once, but twice, in the middle of the same stream.

On the Federal side Halleck ordered Grant's movement on Fort Henry without reference to Buell's plans, thus violating the principle of cooperation. Grant, in his advance on Fort Henry and also in his march to Fort Donelson failed to make full and proper use of cavalry, as evidenced by his field orders and those of his subordinates[121] to learn something about his opponent's strength and dispositions, thus disregarding the principle of security. The Confederate leaders were also guilty of neglecting this same principle, and the laxity of both sides in this respect gave rise to extravagant and unwarranted assumptions as to their opponent's strength.

In a study of this campaign it should be remembered that the weather exercised a tremendous influence on the operations of both sides. The miserable condition of the roads in the theater of operations precluded any sudden or swift movement of troops. Doubtless this had much to do with Buell's failure to move against Johnston while the latter was at Bowling Green and may have actuated Pillow and Floyd in their decision to stay shut up in Fort Donelson rather than to try to out maneuver Grant.

After the surrender of Fort Donelson, Grant wanted to advance against Johnston who had retired to Nashville,[122] but Halleck feared an offensive in Illinois or Missouri by the Confederate force at Columbus and he therefore kept Grant sitting in idleness at Fort Donelson for ten days and also refused to allow Foote's fleet to go farther than Clarksville.[123] It seems quite possible that a vigorous pursuit of Johnston's 14,000 men by Grant's 40,000 would have resulted in the capture of Johnston's army and have left Chattanooga and Vicksburg open to easy capture by the Union forces. Particularly would this have been true if Buell and Grant could have coordinated their movements, the former advancing with energy on Nashville and Chattanooga while the latter pushed south to Vicksburg. Unfortunately there was no one to demand that this be done.

This campaign illustrates, among many other things, most forcibly and strikingly the folly of divided command. If there had been a single directing head over Buell's and Halleck's armies, ordering them to cooperate constantly against Johnston's army, it is difficult to see

[121] RR. 126. 127. 170. 171.
[122] RR. 421.
[123] RR. 648. 655.

how the latter could have saved his army from destruction. The all-important lesson of unity of command seems a difficult one for armies and nations to learn. In spite of the fact that all the great captains of history were supreme in command of their armies—Alexander, Hannibal, Cæsar, Napoleon, Frederick, for example—and although history is full of countless examples of military failures due to this cause alone, yet in the last major conflict on this globe it took four years of more or less constant reverses to bring the allied nations to a realization of the absolute necessity for a single command. In our opinion, such terms as "cooperation" and "paramount interest" and all others which can be interpreted as countenancing divided responsibility in a single theater of operations, should be stricken from military phraseology. We believe that the Forts Henry and Donelson campaign is an excellent case in point.

APHORISME XL.

The Crocodile is slain by the Dolphins policie striking him in his soft and tender belly being unarmed with scales. Experience should teach men more than nature can the creature; for a Generall must strike the enemy where he may be most hurt, and such things as reason deems impossible are not to be attempted, for prudence is of force where force cannot prevaile. Therefore direction is left to the Commander, execution to the Souldier, who is not to question why, but to performe what is given him in charge.—Ward's Animadversions of War *(London, 1639).*

The Variable Probable Error

By LIEUT. PHILIP SCHWARTZ, O. D.

AN examination of T. R. 435-280, *Gunnery For Heavy Artillery*, shows that 44 of 176 pages, or about 25 percent, are devoted to Section IX on "Dispersion and Probability of Hitting." The first few pages of the section give definitions of important quantities such as center of impact, deviation, and error. Thereafter, the section deals with what is usually to the student a maze of mathematical trickery, most of which is absorbed purely for the needs of the moment. The student feels that he will be satisfied if he can pass through this part of the course without suffering too great a loss in credits. Both instructor and student probably believe that the study of this section is good medicine for the student and it is prescribed and taken in this frame of mind. However, it is doubtful (or, as the instructor might say, the probabilities are small) that the instructor himself really feels that he has a firm grasp on the subject. It takes only a few questions to make the instructor admit (if he is frank enough to do so) that the "stuff is too much for him." The subjects of dispersion and probability are very confusing to one who does not go into the study of them thoroughly. Even at this late date it is possible to find one or more statements in Section IX which are probably not justified. Section IX deals with the theory of such games of chance as dice throwing and card playing. It would seem that anyone who cared to study the theory of probability sufficiently along these lines could become the master of many simple games of chance which are sometimes played for high money stakes, and in this way enrich himself. Such is not the case as has been shown repeatedly by the people who have not beaten a "bank" by the use of a "system." This seems to be an example of the fact that the customary "n" must always be a finite value and not on infinite one, thus making probabiltiy computations less valuable.

After a short discussion of such "simple" things as geometrical series, integral exponential equations, and areas under curves, the student reaches what is called the "probable error." This is the *piece de résistance* of the section, and he then studies probable errors continuously throughout the section, and continually until the end of the course. When he completes the course he talks probable error glibly

and he may use it indirectly during target practice in attempting to secure adjustment on a target.

What is this probable error? Section IX, page 90, says the following:

> The probable error is the error which is as likely as not to be exceeded; a value which in the long run will be exceeded one half the time and not exceeded one half of the time.

Section IX deals later with problems in which it is assumed that the probable error is known before a firing is begun; the percentage of hits on a target of given size is then calculated after it has been assumed that an adjustment has been secured. There is no discussion in the section of the difficulties involved in predicting the correct value of the probable error before the firing is completed.

In Section XI, which deals with the adjustment of fire at fixed targets, use is made of the probable error to decide when adjustment has been secured.

> If the fire be adjusted so as to bring the center of impact to within one probable error of the target it can be shown that the probability of obtaining hits on the target is at least 80 percent as great as when the center of impact is on the target.

Further,

> The practical unit of dispersion has been seen to be the probable error. In tabulating firing tables probable errors it is assumed that the probable error of all pieces of the same caliber and model are identical. This is not true in practice. The firing tables probable error is at best an average value. A value of the probable error of any piece can be determined from the results of firing. The method of making these determinations from measured errors has been given. It is not advisable however to place dependence upon a value of the probable error determined from a series of less than fifteen rounds. The true probable error can never be known exactly. It varies with the lot of projectiles, the lot of powder, the number of rounds previously fired with the piece, etc. The variations are not large in percentage and therefore methods of adjustment of fire based primarily on the use of values of the probable error give results fairly well in accord with the theory on which they are based. The above however should explain why any rule will fail partially under unusual conditions. All methods of adjustment of fire make use of values of the probable error of pieces being used.

On pages 13 and 14 T. R. 435-55, *Analysis of Drill and Analysis and Reports of Target Practice*, the following may be read:

> In determining the deviation of the center of impact . . . . the purpose is to show whether or not the battery was actually adjusted when firing was completed. . . . The best probable adjustment would find the center of impact thus determined to be not further from the target than one developed armament probable error.

T. R. 430-85, *Field Artillery Firing,* says the following:

> Par. 265. . . . A minor change is one which is less than a probable error.
>
> Par. 272, Trial Fire.—The object is to bracket the objective between two verified elevations differing by one fork (4 field probable errors) or to find a verified bracketing range. . . .
>
> Par. 275, Improvement Fire.—When the trial elevation has been obtained, fire for improvement is begun. The object is to find an elevation giving substantially as many observations short as over. With this trial elevation fire 12 rounds per piece. If there is not for each piece an equality of shorts and overs, modify the elevation by as many twelfths of a fork as there are rounds to be changed in sense to obtain the equality.

What is the best method of determining the firing tables value of the probable error? From considerations of pure theory, only the fact that a finite number rounds is fired prevents the determination of the "true" probable error. For example, there is at least one Ordnance report in which is contained a demonstration of the desirability of firing groups of 20 rounds for the purpose of determining the true value of the probable error. On page 175, Vol. 61, of the COAST ARTILLERY JOURNAL there is a similar demonstration of the desirability of firing not more than 20 rounds for determining the proving ground probable error. Such demonstrations would be of considerably greater value if the additional factor of variable probable error did not enter into its determination. There is no such thing as a true value of the probable error, which can be depended upon to repeat itself if there is no change in gun, ammunition, gun crew, position of gun, and position of target. As an illustration of how the writer conceives that the probable error varies, consider the following. Suppose that a self-contained horizontal base coincidence type of range finder is used to measure the distance to a stake on land or out on the water. Let the distance be determined by averaging ten or ten hundred readings. Let a trained observer take a set of readings on a clear day and then follow it by a set of readings on a foggy day. The average in one case will probably not differ very much from the average in the other case if ten hundred readings are taken and the difference in averages will not be unduly greater if only ten readings are taken. However, it is to be expected that on a clear day the observer's readings will cluster closely about the average value because coincidence will be obtained easily and without estimation. On a foggy da ycoincidences will not be obtained so easily and the observer will be compelled to estimate the condition of coincidence; there will result a series of readings which do not cluster closely about the average value. The difference in clustering of observations on a clear and foggy day is similar to the dif-

ference in clustering of the points of fall of shots. In firing, the cause of the difference in clustering may not be due to difference in visibility alone; it may be due to any change in conditions which affects the mount, the gun, the ammunition, the gun crew, or the atmosphere. This difference in clustering corresponds exactly to the difference in probable errors which may be expected in firing at different times and under different conditions. If weather conditions do not vary materially, if the mount and gun are kept in good condition, if the ammunition is held at a uniform temperature during the firing, if the firing is conducted with care, and if the personnel of the gun crew remains the same, the variation in probable error can be kept at a minimum.

Even at the proving ground where range firing is conducted under the equivalent of laboratory conditions, probable errors vary by as much as 100% or more. In the field and at harbor defenses they can be expected to vary by a greater amount than at the proving ground. Figure 1 shows the developed armament probable errors resulting from Coast Artillery target practices held in 1925. At the same range probable errors varying from a fraction to several times the firing tables probable error were developed. With such information available only a brave battery commander would be willing to use the firing tables value of the probable error as a unit of measure in securing adjustment, for he would have to be willing to pay the penalty in poor results which such a choice would probably yield him. At some batteries where more than one target practice was fired in 1925, with little change in materiel or in gun crew, varying probable errors were obtained, examples of which follow.

Shoot	*Caliber inches*	*Range yards*	*Probable error in range yards*
1st	6	9100	26
2nd		9400	50
1st	6	7600	185
2nd		7200	92
1st	6	5900	74
2nd		5600	42
1st	10	10500	59
2nd		10100	103
1st	12	8000	48
2nd		10300	86
1st	12	8600	115
2nd		7300	34
1st	14	13300	44
2nd		13100	94

The small differences in range between the first and second shoots can account for only a small part of the difference in probable errors. Some of these differences may be due to firing only a small number of rounds, but not all of them.

In an extensive firing of the 155-mm. howitzer at the proving ground the following results were obtained. The firings were made at 32° elevation, each value of the probable error being based on a group of 20 rounds.

PROBABLE ERROR IN RANGE-YARDS

Day	Zone I	II	IV	V	VI	VII
1st	58	22	54	57	57	36
2nd	35	37	64	60	43	61

Another e xample of varying probable errors is shown in the results of firing a large number of groups of rounds from the 155-mm. gun on different days. One set, fired at about 16,000 yards range, gave the following results.

Number of rounds in group	*Probable error in range yards*
19	88
20	68
16	76
10	72
9	96
18	44
20	100
16	96
20	48
20	68
20	60
20	88
20	96
20	52

Another set, fired from the 155-mm. gun at about 15,000 yards range, gave the following results.

Number of rounds in group	*Probable error in range yards*
8	72
16	144
9	84
9	88

The following examples show the effect on adjustment of not being able to predict the proper value of the probable error. Assume that the ladder of dispersion may be represented by 8 zones which are equally spaced about the center of impact as in the diagram on page 103 of T. R. 435-280 (Fig. 2). The statement was made in T. R. 430-85 that if the center of impact is within one probable error of the target, the probability of obtaining hits on the target is at least 80% as great as when the center of impact is on the target. This situation can be represented by the following diagram in which G represents an ideal grouping with the center of impact at the target and G_3 represents a grouping with the center of impact one probable error distant from the target (Fig. 3). In grouping G with a danger zone assumed to be one probable error, or 100 yards, on each side of the target, there are 50% of hits to be expected if the center of impact is on the target. If the center of impact is one probable error distant from the target as in Group G_3, only 41 per cent of hits are to be expected in the danger zone. Therefore group G_3 will have $\frac{41}{50} = 82\%$ of the ideal number of hits. This seems to prove the truth of the statement quoted earlier in this paragraph.

Suppose that the probable error assumed before firing is begun is 100 yards, whereas after firing it is discovered that the developed armament error was really only 50 yards. Suppose that the center of impact was adjusted at a point one assumed probable error, or 100 yards, distant from the target. Then using the ladders, the situation would resemble that shown in Figure 4. There would result the same number of hits in the danger zone of group G_4 as in the ideal group G, a total of 50%. If the battery commander had been able to predict that the developed probable error would be 50 yards, and if he had attempted to place the center of impact one developed probable error, or 50 yards, from the target the situation would have resembled that shown in Figure 5. Seventy-three percent of hits would have been obtained in the assumed danger zone in this case, whereas only 50% of hits were obtained due to not knowing that the probable error was 50 yards instead of 100.

Suppose on the other hand that after firing it is discovered that the developed probable error is 200 yards and the firing was adjusted at a point one assumed probable error, or 100 yards, from the target. In this case the battery commander probably wasted much ammunition and time getting adjusted at a point one half of a probable error instead of one probable error away from the target. The situation would resemble that shown in Figure 6. Only 25% of hits would

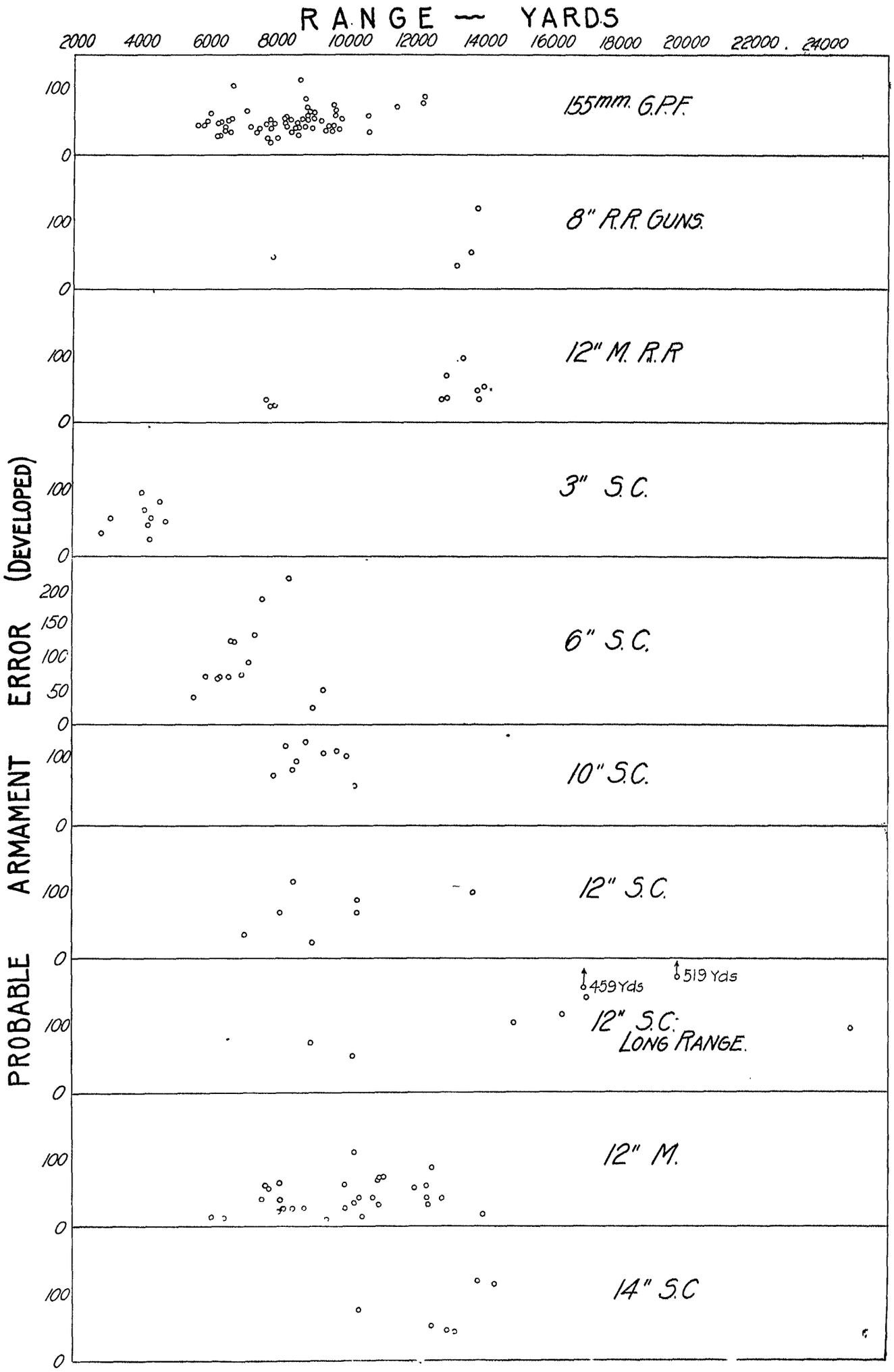

RANGE — YARDS
2000 4000 6000 8000 10000 12000 14000 16000 18000 20000 22000 24000
PROBABLE ARMAMENT ERROR (DEVELOPED)
155mm. G.P.F.
8" R.R. GUNS.
12" M. R.R
3" S.C.
6" S.C.
10" S.C.
12" S.C.
459 Yds
519 Yds
12" S.C. LONG RANGE.
12" M.
14" S.C
100
0
200
150
50

Fig. 1

G

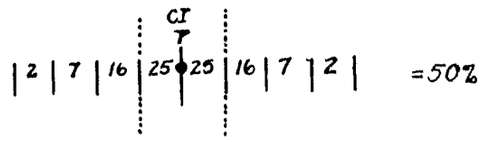


fig 2

G_3

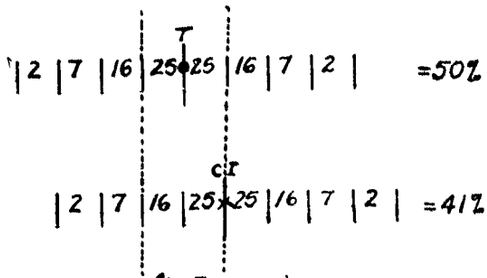


fig 3

G_4

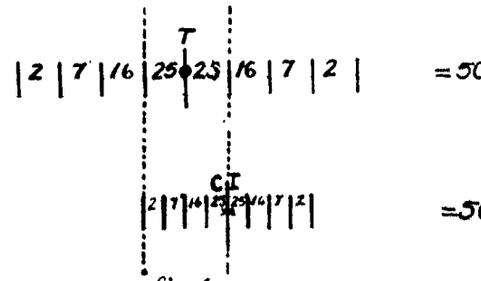


fig 4

G_5

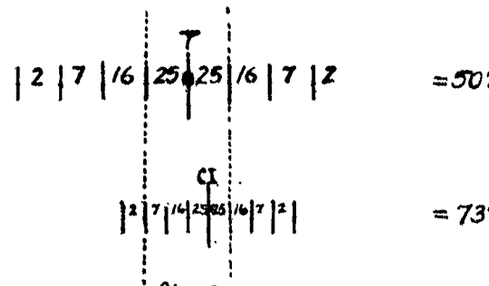


fig 5

G_6

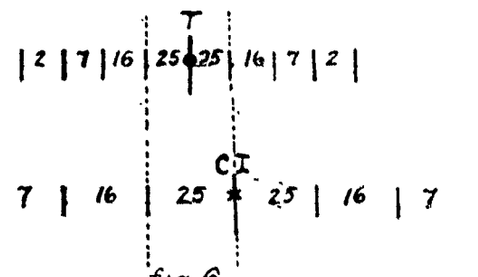


fig 6

G_7

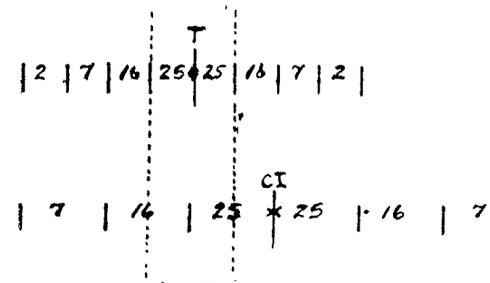


fig. 7

Figs. 2. 3. 4. 5. 6. 7.

have been obtained in the danger zone, Figure 6, whereas 41% were expected. The battery commander would have spent a great deal of time and effort getting the center of impact only one half of a developed probable error from the target, an accuracy which according to present regulations is not considered necessary. If the battery commander had realized that the developed probable error was as much as 200 yards, and if he had placed the center of impact one developed probable error, or 200 yards, away from the target, the situation would have resembled that shown in Figure 7. Twenty-five per cent of hits would have been obtained in the assumed danger zone in this case; 25% were obtained in G_6 due to not realizing that the probable error was 200 yards instead of 100 yards. A gain of only 3% of hits was obtained by going to the trouble of adjusting to a point one half of a developed probable error away from the target. Moving the center of impact in from o point one probable error from the target to a point one half of a probable error from the target involves much more trouble than does an equal movement of the center of impact at any other part of the area around the target except the area from one half of a probable error away from the target to the target itself.

Contrary to the opinion concerning the constancy of the probable error expressed in T. R. 435-280, it has been shown by the above demonstration and experimental results, that variations in the magnitude of the probable error are large, and it is therefore doubtful if the methods of adjustment which use the probable error as a unit of measure are very efficient. It is probable that adjustment of fire would be a very much simpler proposition if the probable error did not vary in such an unpredictable manner. Some methods of adjustment must be adopted and if they are not based on the probable error on what can they be based? This is a difficult question to answer. If the probable error can be predicted, the methods now in use are satisfactory. Practically, the probable error cannot be predicted with sufficient exactness, and therefore many shoots are unnecessarily lengthened or ammunition wasted by adopting a system of adjustment which uses the probable error as a unit of measure.

Once a battery gets into action, the principal effort of the battery commander is devoted to placing the center of impact of his shots as near to the target as possible in a minimum of time and with the least expenditure of ammunition. Ordinarily he is not interested in the size of dispersion zone if he has satisfied himself previously that it is not excessive. His corrections are based on the deviation of the

center of impact from the target. He may move the center of impact closer to the target by making a change in the elevation or range setting corresponding to a multiple or factor of the probable error or corresonding to a multiple or factor of some other unit which has been shown to be convenient and satisfactory. Although multiples of the probable error may sometimes be considered satisfactory they are seldom convenient to manipulate accurately because of the odd figures involved. As soon as the center of impact begins to approach closely to the target, the question arises as to when the battery commander may temporarily cease slowing up the fire because of waiting for application of correction data based on results of observation of fire. According to T. R. 435-280, when the center of impact is within one probable error of the target, fire for effect should be begun and the battery may be considered to be adjusted. As has been shown, the time when this occurs is difficult to determine accurately since little is known concerning the value of the probable error being developed in the shoot.

The following sugestions may be of value in formulating more satisfactory methods of adjustment. Instead of employing the probable error as a unit of measure use a unit which is equal to ½% of the range to the nearest ten yards in range, and a unit of 1 mil or .05 degree in deflection. This suggestion is based on the fact that the proving ground probable error averages about ½% of the range and 1 mil in deflection for all except the very shortest ranges. With this as a unit of measure, certain arbitrary multiples of these units may be adopted for the fork, basing the multiple applied on the experience of the artillery branch itself. Heretofore the field probable error has been assumed sometimes to be 1½ times the proving ground probable error, at other times twice. This assumption probably has very little exact basis and apparently was founded on the idea that proving ground uniformity can not be obtained under service conditions. At harbor defenses probable errors smaller than the firing tables values are occasionally obtained, and enthusiasts have, without due consideration, or based on a single series of firings, suggested correcting the firing tables value of the probable error (see COAST ARTILLERY JOURNAL Vol. 60, page 200). An extensive program was recently fired at the proving ground for the purpose (it is understood) of investigating the accuracy of the 155-mm. howitzer firing tables probable errors. Whether the probable error chosen from the firing tables should be based on the corrected or uncorrected range has even been questioned. Examination of Figure 1 shows that out of ten calibers, 5 average about ½% of the range for the range probable error. These 5 include tractor-

drawn and railway artillery, thus showing that this small value of the probable error is not restricted to fixed batteries which may be expected to have better accuracy than the mobile batteries.

To decide when adjustment has been completed, that is, when fire for effect may be begun, each caliber of gun should have a calculated fixed distance for each type of target. This distance should be based on the caliber of gun, type of projectile, size and type of target, and experience in firing.

If these changes are made after a sufficient study, it should be possible to eliminate most of the probability discussion now contained in the training regulations on gunnery. There can be substituted for the former discussions a much briefer description of the fundamentals of dispersion of fire, plus a discussion of a few arbitrary rules of adjustment, based on the foregoing considerations. There should then be no more reason for artillerymen going into problems involving probability and least squares than there is now for his going into trajectory computation studies. Such studies should be left for ordnance specialists or for artillerymen who are especially assigned to and trained for such advanced study. Trajectory computation as well as the study of probability theory belong to the field of ballistics and theoretical gunnery and not to that of practical gunnery.

It was previously mentioned that the present consensus of mathematical reasoning has led to the belief that 20 rounds is the proper number for the determination of the proving ground probable error for insertion in the firing tables. It has been shown by examples that it is not sufficient to fire 20 rounds on a single day, and that firings should be made on several days. It seems desirable to fire a smaller number of rounds, distributing the 20 rounds (if only this number is available) in several days' firing. Groups greater than 10 rounds would seem excessive, and 5 rounds (contrary to present approved ideas) should not be too few.

In the foregoing article the writer has endeavored to point out difficulties involved in the proving ground determination and the service use of the probable error because of its behavior. Whether or not the reader believes that changes in methods of adjustment are desirable at present, the fact remains, as shown in this article, that whenever in service firing the probable error is used as a unit of measure, great care must be exercised in order to prevent the loss of time and ammunition.

Brevet General Officers in the Regular Army

1775-1927

EDITOR'S NOTE.—The following lists include only brevet commissions issued in the Regular Army; they do not include commissions in the Volunteers nor in the National Army. The following symbols are used: * indicates a graduate of the United States Military Academy; [1] service in the Revolutionary War; [2] service in the War of 1812; [3] service in the War with Mexico; [4] service in the Civil War; [5] service in the War with Spain; [6] service in the World War. These lists are not elsewhere available.

GENERALS

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
1	*Bliss, Tasker H. [5 6]	20 May 1918	On retired list			MG Ret; Gen (emer), 1917.

LIEUTENANT GENERALS

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
1	Scott, Winfield [2 3 4]	29 Mar 1847	1 Nov 1861	Retired	29 May 1866	MG, US Army.

MAJOR GENERALS

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
1	Clinton, James [1]	30 Sep 1783	3 Nov 1783	Hon Dis	22 Dec 1812	BG, Cont Army.
2	McIntosh, Lachlan [1]	30 Sep 1783	3 Nov 1783	Hon Dis	20 Feb 1806	BG, Cont Army.
3	Paterson, John [1]	30 Sep 1783	3 Nov 1783	Hon Dis	19 Jul 1808	BG, Cont Army.
4	Wayne, Anthony [1]	30 Sep 1783	3 Nov 1783	Hon Dis	15 Dec 1796	BG, Cont Army; MG, 1792.
5	De Haas, John P. [1]	30 Sep 1783	3 Nov 1783	Hon Dis	3 Jun 1786	BG, Cont Army.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
6	Muhlenberg, Peter [1]	30 Sep 1783	3 Nov 1783	Hon Dis	1 Oct 1807	BG, Cont Army.
7	Clinton, George [1]	30 Sep 1783	3 Nov 1783	Hon Dis	20 Apr 1812	BG, Cont Army.
8	Hand, Edward [1]	30 Sep 1783	3 Nov 1783	Hon Dis	3 Sep 1802	BG, Cont Army; MG, 1798.
9	Scott, Charles [1]	30 Sep 1783	3 Nov 1783	Hon Dis	22 Oct 1813	BG, Cont Army.
10	Huntington, Jedediah [1]	30 Sep 1783	3 Nov 1783	Hon Dis	25 Sep 1818	BG, Cont Army.
11	Stark, John [1]	30 Sep 1783	3 Nov 1783	Hon Dis	8 May 1822	BG, Cont Army.
12	Wilkinson, James [1 2]	12 Jul 1812	2 Mar 1813	Aptd MG	28 Dec 1825	BG, US Army.
13	Scott, Winfield [2 3 4]	25 Jul 1814	25 Jun 1841	Aptd MG	29 May 1866	BG, US Army.
14	Ripley, Eleazar W. [2]	25 Jul 1814	1 Feb 1820	Resigned	2 Mar 1839	BG, US Army.
15	Gaines, Edmund P. [2]	15 Aug 1814	6 Jun 1849	Died	6 Jun 1849	BG, US Army.
16	Macomb, Alexander [2]	11 Sep 1814	24 May 1828	Aptd MG	25 Jun 1841	BG, US Army.
17	Jesup, Thomas S. [2 3]	8 May 1828	10 Jun 1860	Died	10 Jun 1860	BG, QMC.
18	Taylor, Zachary [2 3]	9 May 1846	29 Jun 1846	Aptd MG	9 Jul 1850	Col, 6th Inf.
19	Twiggs, David E. [2 3]	23 Sep 1846	1 Mar 1861	Dismissed	15 Jul 1862	BG, US Army.
20	Quitman, John A. [2]	23 Sep 1846	14 Apr 1847	Aptd MG	17 Jul 1858	BG, US Vols.
21	Worth, William J. [2 3]	23 Sep 1846	7 May 1849	Died	7 May 1849	Col, 8th Inf; Sword from Congress.
22	Kearney, Stephen W. [2 3]	6 Dec 1846	31 Oct 1848	Died	31 Oct 1848	BG, US Army.
23	Wool, John E. [2 3 4]	23 Feb 1847	16 May 1862	Aptd MG	10 Nov 1869	BG, US Army.
24	Smith, Persifor F. [2]	20 Aug 1847	17 May 1858	Died	17 May 1858	Col, Mtd Riflemen.
25	Riley, Bennet [2 3]	20 Aug 1847	9 Jun 1853	Died	9 Jun 1853	Lt Col, 2d Inf.
26	Cadwalader, George [3 4]	13 Sep 1847	20 Jul 1848	Hon Dis	3 Feb 1879	BG, US Army.
27	Brady, Hugh [2 3]	30 May 1848	15 Apr 1851	Died	15 Apr 1851	Col. 2d Inf.
28	Gibson, George [2 3 4]	30 May 1848	29 Sep 1861	Died	29 Sep 1861	Col, Com Gen.
29	Towson, Nathan [2 3]	30 May 1848	20 Jul 1854	Died	20 Jul 1854	Col, PM Gen.
30	Jones, Roger [2 3]	30 May 1848	15 Jul 1852	Died	15 Jul 1852	Col, Adj Gen.
31	Brooke, George M. [2 3]	30 May 1848	9 Mar 1851	Died	9 Mar 1851	Col, 5th Inf.
32	Sumner, Edwin V. [3 4]	31 May 1862	21 Mar 1863	Died	21 Mar 1863	BG, US Army.
33	*Totten, Joseph G. [2 3 4]	21 Apr 1864	22 Apr 1864	Died	22 Apr 1864	BG, C of Engrs.
34	*Meigs, Montgomery C. [3 4]	5 Jul 1864	6 Feb 1882	Retired	2 Jan 1892	BG, QM Gen.
35	*Anderson, Robert [3 4]	3 Feb 1865	On retired list		27 Oct 1871	BG, Ret.
36	Harney, William S. [3 4]	13 Mar 1865	On retired list		9 May 1889	BG, Ret.
37	*McDowell, Irvin [3 4]	13 Mar 1865	25 Nov 1872	Aptd MG	4 May 1885	BG, US Army.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
38	*Rosecrans, William S. [3 4]	13 Mar 1865	28 Mar 1867	Resigned	11 Mar 1898	BG, US Army.
39	*Ripley, James W. [2 3 4]	13 Mar 1865	On retired list		15 Mar 1870	BG, Ret.
40	*Thomas, Lorenzo [3 4]	13 Mar 1865	22 Feb 1869	Retired	2 Mar 1875	BG, Adjt Gen.
41	*Cooke, Philip St. G. [3 4]	13 Mar 1865	29 Oct 1873	Retired	20 Mar 1895	BG, US Army.
42	*Pope, John [3 4]	13 Mar 1865	26 Oct 1882	Aptd MG	23 Sep 1892	BG, US Army.
43	*Hooker, Joseph [3 4]	13 Mar 1865	15 Oct 1868	Aptd MG	31 Oct 1879	BG, US Army.
44	*Ramsay, George D. [2 3 4]	13 Mar 1865	On retired list		23 May 1882	BG, Ret.
45	*Delafield, Richard [2 3 4]	13 Mar 1865	8 Aug 1866	Retired	5 Nov 1873	BG, C of Engrs.
46	Holt, Joseph [4]	13 Mar 1865	1 Dec 1875	Retired	1 Aug 1894	BG, JA Gen.
47	*Eaton, Amos B. [3 4]	13 Mar 1865	1 May 1874	Retired	21 Feb 1877	BG, Com Gen.
48	*Hancock, Winifield S. [3 4]	13 Mar 1865	26 Apr 1866	Aptd MG	9 Feb 1886	BG, US Army.
49	Barnes, Joseph K. [3 4]	13 Mar 1865	30 Jun 1882	Retired	5 Apr 1883	BG, Sur Gen.
50	*Dyer, Alexander B. [3 4]	13 Mar 1865	20 May 1874	Died	20 May 1874	BG, C of Ord.
51	*Schofield, John M. [4]	13 Mar 1865	4 Mar 1869	Aptd MG	4 Mar 1906	BG, US Army.
52	*Howard, Oliver O. [4]	13 Mar 1865	19 Mar 1886	Aptd MG	26 Oct 1909	BG, US Army.
53	Terry, Alfred H. [4]	13 Mar 1865	3 Mar 1886	Aptd MG	16 Dec 1890	BG, US Army.
54	Thomas, Charles [3 4]	13 Mar 1865	29 Jul 1866	Retired	1 Feb 1878	Col, Ast QMG.
55	*Hunter, David [3 4]	13 Mar 1865	31 Jul 1866	Retired	2 Feb 1886	Col, 6th Cav.
56	*Heintzelman, Samuel P. [3 4]	13 Mar 1865	22 Feb 1869	Aptd MG	1 May 1880	Col, 17th Inf.
57	*Canby, Edward R. S. [3 4]	13 Mar 1865	11 Apr 1873	Died	11 Apr 1873	Col, 19th Inf.
58	*Franklin, William B. [3 4]	13 Mar 1865	15 Mar 1866	Resigned	8 Mar 1903	Col, 12th Inf.
59	*Townsend, Edward D. [3 4]	13 Mar 1865	15 Jun 1880	Retired	10 May 1893	Col, Ast AG.
60	*Swords, Thomas [3 4]	13 Mar 1865	22 Feb 1869	Retired	20 Mar 1886	Col, Ast QMG.
61	*Marcy, Randolph B. [3 4]	13 Mar 1865	2 Jan 1881	Retired	22 Nov 1887	Col, IG.
62	*Sacket, Delos B. [3 4]	13 Mar 1865	8 Mar 1885	Died	8 Mar 1885	Col, IG.
63	*Casey, Silas [3 4]	13 Mar 1865	8 Jul 1868	Retired	22 Jan 1882	Col, 4th Inf.
64	*Wood, Thomas J. [3 4]	13 Mar 1865	9 Jun 1868	Aptd MG	25 Feb 1906	Col, 2d Cav.
65	*Hoffman, William [3 4]	13 Mar 1865	1 May 1870	Retired	12 Aug 1884	Col, 3d Inf.
66	*Shiras, Alexander E. [3 4]	13 Mar 1865	14 Apr 1875	Died	14 Apr 1875	Col, A Com Gen.
67	*Crosman, George H. [3 4]	13 Mar 1865	29 Jul 1866	Retired	28 May 1882	Col, Ast QMG.
68	*Schriver, Edmund [3 4]	13 Mar 1865	4 Jan 1881	Retired	10 Feb 1899	Col, IG.
69	*Sherman, Thomas W. [3 4]	13 Mar 1865	31 Dec 1870	Aptd MG	16 Mar 1879	Col, 3d Art.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
70	*Butterfield, Daniel [4]	13 Mar 1865	14 Mar 1870	Resigned	17 Jul 1901	Col, 5th Inf; MH.
71	*Emory, William H. [3 4]	13 Mar 1865	1 Jul 1876	Retired	1 Dec 1887	Col, 5th Inf.
72	*Buchanan, Robert C. [3 4]	13 Mar 1865	31 Dec 1870	Retired	29 Nov 1878	Col, 1st Inf.
73	*Hardie, James A. [3 4]	13 Mar 1865	14 Dec 1876	Died	14 Dec 1876	Col, IG.
74	*Ketchum, William S. [3 4]	13 Mar 1865	15 Dec 1870	Retired	28 Jun 1871	Col, 11th Inf.
75	*Nichols, William A. [3 4]	13 Mar 1865	8 Apr 1869	Died	8 Apr 1869	Col, Ast AG.
76	*Brice, Benjamin W. [3 4]	13 Mar 1865	1 Jan 1872	Retired	4 Dec 1892	Col, PM Gen.
77	*Vinton, David H. [3 4]	13 Mar 1865	29 Jul 1866	Retired	21 Feb 1873	Lt Col, DQMG.
78	*Williams, Seth [3 4]	13 Mar 1865	23 Mar 1866	Died	23 Mar 1866	Lt Col, Ast AG.
79	*Fry, James B. [3 4]	13 Mar 1865	1 Jul 1881	Retired	11 Jul 1894	Lt Col, Ast AG.
80	*Simpson, Marcus D. L. [3 4]	13 Mar 1865	28 Aug 1888	Retired	7 Apr 1909	Lt Col, A Com Gen.
81	*Barnard, John G. [3 4]	13 Mar 1865	2 Jan 1881	Retired	14 May 1882	Lt Col, Engrs.
82	*Cullum, George W. [3 4]	13 Mar 1865	13 Jan 1874	Retired	28 Feb 1892	Lt Col, Engrs.
83	*Benham, Henry W. [3 4]	13 Mar 1865	30 Jun 1882	Retired	1 Jun 1884	Lt Col, Engrs.
84	*Humphreys, Andrew A. [3 4]	13 Mar 1865	30 Jun 1879	Retired	27 Dec 1883	Lt Col, Engrs.
85	King, John H. [3 4]	13 Mar 1865	20 Feb 1882	Retired	7 Apr 1888	Lt Col, 14th Inf.
86	*Augur, Christopher C. [3 4]	13 Mar 1865	10 Jul 1885	Retired	16 Jan 1898	Lt Col, 12th Inf.
87	*Barry, William F. [3 4]	13 Mar 1865	18 Jul 1879	Died	18 Jul 1879	Lt Col, 1st Art.
88	*Hunt, Henry J. [3 4]	13 Mar 1865	14 Sep 1883	Retired	11 Feb 1889	Lt Col, 3d Art.
89	*Steele, Frederick [3 4]	13 Mar 1865	12 Jan 1868	Died	12 Jan 1868	Lt Col, 3d Inf.
90	*Doubleday, Abner [3 4]	13 Mar 1865	11 Dec 1873	Retired	26 Jan 1893	Lt Col, 17th Inf.
91	*Sykes, George [3 4]	13 Mar 1865	8 Feb 1880	Died	8 Feb 1880	Lt Col, 5th Inf.
92	*Sturgis, Samuel D. [3 4]	13 Mar 1865	11 Jun 1886	Retired	28 Sep 1889	Lt Col, 6th Cav.
93	*French, William H. [3 4]	13 Mar 1865	1 Jul 1880	Retired	20 May 1881	Lt Col, 2d Art.
94	Crawford, Samuel W. [4]	13 Mar 1865	19 Feb 1873	Retired	3 Nov 1892	Lt Col, 2d Inf.
95	*Stoneman, George [3 4]	13 Mar 1865	16 Aug 1871	Retired	5 Sep 1894	Lt Col, 3d Cav.
96	*Smith, Andrew J. [3 4]	13 Mar 1865	6 May 1869	Resigned	30 Jan 1897	Lt Col, 5th Cav.
97	*Hartsuff, George L. [4]	13 Mar 1865	29 Jun 1871	Aptd MG	16 May 1874	Lt Col, Ast AG.
98	*Clarke, Henry F. [3 4]	13 Mar 1865	9 Nov 1884	Retired	10 May 1887	Lt Col, A Com Gen.
99	*Allen, Robert [3 4]	13 Mar 1865	21 Mar 1878	Retired	5 Aug 1886	Maj, QM.
100	*Donaldson, James L. [3 4]	13 Mar 1865	15 Mar 1869	Retired	4 Nov 1885	Maj, QM.
101	*Easton, Langdon C. [3 4]	13 Mar 1865	24 Jan 1881	Retired	29 Apr 1884	Maj, QM.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
102	*Van Vliet, Stewart [3 4]	13 Mar 1865	22 Jan 1881	Retired	28 Mar 1901	Maj, QM.
103	Rucker, Daniel H. [3 4]	13 Mar 1865	23 Feb 1882	Retired	6 Jan 1910	Maj, QM.
104	*Tower, Zealous B. [3 4]	13 Mar 1865	10 Jan 1883	Retired	20 Mar 1900	Maj, Engrs.
105	*Wright, Horatio G. [3 4]	13 Mar 1865	6 Mar 1884	Retired	2 Jul 1899	Maj, Engrs.
106	*Newton, John [3 4]	13 Mar 1865	27 Aug 1886	Retired	1 May 1895	Maj, Engrs.
107	Carleton, James H. [3 4]	13 Mar 1865	7 Jan 1873	Died	7 Jan 1873	Maj, 6th Cav.
108	*Granger, Robert S. [3 4]	13 Mar 1865	10 Dec 1873	Retired	25 Apr 1894	Maj, 5th Inf.
109	*Beckwith, Amos [3 4]	13 Mar 1865	4 Oct 1889	Retired	26 Oct 1894	Maj, Com.
110	Elliott, Washington L. [3 4]	13 Mar 1865	20 Mar 1879	Retired	29 Jun 1888	Maj, 1st Cav.
111	*Baird, Absalom [3 4]	13 Mar 1865	20 Aug 1888	Retired	14 Jun 1905	Maj, Ast IG.
112	*Davidson, John W. [3 4]	13 Mar 1865	26 Jun 1881	Died	26 Jun 1881	Maj, 2d Cav.
113	*Ord, Edward O. C. [3 4]	13 Mar 1865	6 Dec 1880	Retired	22 Jul 1883	Maj, 4th Art; MG, Ret, 1881.
114	*Ingalls, Rufus [3 4]	13 Mar 1865	1 Jul 1883	Retired	15 Jan 1893	Maj, QM.
115	*Pleasonton, Alfred [3 4]	13 Mar 1865	1 Jan 1868	Resigned	17 Feb 1897	Maj, 2d Cav.
116	Robinson, John C. [3 4]	13 Mar 1865	6 May 1869	Aptd MG	18 Feb 1897	Maj, 2d Inf.
117	*Johnson, Richard W. [3 4]	13 Mar 1865	12 Oct 1867	Aptd MG	21 Apr 1897	Maj, 4th Cav.
118	*Carr, Eugene A. [3 4]	13 Mar 1865	15 Feb 1893	Retired	2 Dec 1910	Maj, 5th Cav.
119	*Whipple, William D. [3 4]	13 Mar 1865	2 Aug 1890	Retired	1 Apr 1902	Maj, Ast AG.
120	*Smith, William F. [3 4]	13 Mar 1865	21 Mar 1867	Resigned	28 Feb 1903	Maj, Engrs.
121	*Foster, John G. [3 4]	13 Mar 1865	2 Sep 1874	Died	2 Sep 1874	Maj, Engrs.
122	*Ricketts, James B. [3 4]	13 Mar 1865	3 Jan 1867	Aptd MG	22 Sep 1887	Maj, 1st Art.
123	*Gillmore, Quincy A. [3 4]	13 Mar 1865	7 Apr 1888	Died	7 Apr 1888	Maj, Engrs.
124	*Getty, George W. [3 4]	13 Mar 1865	2 Oct 1883	Retired	1 Oct 1901	Maj, 5th Art.
125	*Brannan, John M. [3 4]	13 Mar 1865	19 Apr 1882	Retired	16 Dec 1892	Maj, 1st Art.
126	*Howe, Albion P. [3 4]	13 Mar 1865	30 Jun 1882	Retired	25 Jan 1897	Maj, 4th Art.
127	*Grover, Cuvier [3 4]	13 Mar 1865	6 Jun 1885	Died	6 Jun 1885	Maj, 3d Inf.
128	*Garrard, Kenner [3 4]	13 Mar 1865	10 Nov 1866	Resigned	15 May 1879	Maj, 3d Cav.
129	Wheaton, Frank [4]	13 Mar 1865	2 Apr 1897	Aptd MG	18 Jun 1903	Maj, 2d Cav.
130	*Stanley, David S. [4]	13 Mar 1865	1 Jun 1892	Retired	13 Mar 1902	Maj, 5th Cav.
131	*Carlin, William P. [3 4]	13 Mar 1865	24 Nov 1893	Retired	5 Oct 1903	Maj, 16th Inf.
132	*Woods, Charles R. [4]	13 Mar 1865	15 Dec 1874	Retired	26 Feb 1885	Maj, 18th Inf.
133	*Parke, John G. [3 4]	13 Mar 1865	2 Jul 1889	Retired	16 Dec 1900	Maj, Engrs.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
134	*Warren, Gouvernor K. [3 4]	13 Mar 1865	8 Aug 1882	Died	8 Aug 1882	Maj, Engrs.
135	*Gibbon, John [3 4]	13 Mar 1865	20 Apr 1891	Retired	6 Feb 1896	Capt, 4th Art.
136	*Seymour, Truman [3 4]	13 Mar 1865	1 Nov 1876	Retired	30 Oct 1891	Capt, 5th Art.
137	*Griffin, Charles [3 4]	13 Mar 1865	15 Sep 1867	Died	15 Sep 1867	Capt, 5th Art.
138	*Granger, Gordon [3 4]	13 Mar 1865	10 Jan 1876	Died	10 Jan 1876	Capt, 3d Cav.
139	*Gibbs, Alfred [3 4]	13 Mar 1865	26 Dec 1868	Died	26 Dec 1868	Capt, 3d Cav.
140	Davis, Jefferson C. [3 4]	13 Mar 1865	30 Nov 1879	Died	30 Nov 1879	Capt, 1st Art.
141	*Ayres, Romeyn B. [3 4]	13 Mar 1865	4 Dec 1888	Died	4 Dec 1888	Capt, 5th Art.
142	*Arnold, Richard [3 4]	13 Mar 1865	8 Nov 1882	Died	8 Nov 1882	Capt, 5th Art.
143	*Kautz, August V. [3 4]	13 Mar 1865	5 Jan 1892	Retired	4 Sep 1895	Capt, 6th Cav.
144	*Crook, George [4]	13 Mar 1865	6 Apr 1888	Aptd MG	21 Mar 1890	Capt, 4th Inf.
145	*McCook, Alexander M. [3 4]	13 Mar 1865	9 Nov 1894	Aptd MG	12 Jun 1903	Capt, 3d Inf.
146	*Hazen, William B. [4]	13 Mar 1865	16 Jan 1887	Died	16 Jan 1887	Capt, 8th Inf.
147	*Webb, Alexander S. [4]	13 Mar 1865	5 Dec 1870	Hon Dis	— — —	Capt, 11th Inf.
148	Fessenden, Francis [4]	13 Mar 1865	1 Nov 1866	Retired	2 Jan 1906	Capt, 19th Inf.
149	*Tyler, Robert O. [4]	13 Mar 1865	1 Dec 1874	Died	1 Dec 1874	Capt, Ast QM.
150	Long, Eli [4]	13 Mar 1865	16 Aug 1867	Aptd MG	5 Jan 1903	Capt, 4th Cav.
151	*Hawkins, John P. [4]	13 Mar 1865	29 Sep 1894	Retired	7 Feb 1914	Capt, Com.
152	*Turner, John W. [4]	13 Mar 1865	4 Sep 1871	Resigned	8 Apr 1899	Capt, Com.
153	Mower, Joseph A. [3 4]	13 Mar 1865	6 Jan 1870	Died	6 Jan 1870	Capt, 1st Inf.
154	*Torbert, Alfred T. A. [4]	13 Mar 1865	31 Oct 1866	Resigned	29 Aug 1880	Capt, 5th Inf.
155	*Carroll, Samuel S. [4]	13 Mar 1865	9 Jun 1869	Aptd MG	28 Jan 1892	Capt, 10th Inf.
156	*Merritt, Wesley [4 5]	13 Mar 1865	25 Apr 1895	Aptd MG	3 Dec 1910	Capt, 2d Cav.
157	*Averell, William W. [4]	13 Mar 1865	18 May 1865	Resigned	3 Feb 1900	Capt, 3d Cav.
158	*Weitzel, Godfrey [4]	13 Mar 1865	19 Mar 1884	Died	19 Mar 1884	Capt, Engrs.
159	*Wilson, James H. [4 5]	13 Mar 1865	31 Dec 1870	Hon Dis	23 Feb 1925	Capt, Engrs; MG, 1901.
160	McIntosh, John B. [3 4]	13 Mar 1865	30 Jul 1870	Retired	29 Jun 1888	Capt, 5th Cav.
161	*Custer, George A. [4]	13 Mar 1865	25 Jun 1876	Killed	25 Jun 1876	Capt, 5th Cav.
162	*Ames, Adelbert [4 5]	13 Mar 1865	23 Feb 1870	Resigned	— — —	Capt, 5th Art; MH.
163	*Kilpatrick, Judson [4]	13 Mar 1865	1 Dec 1865	Resigned	2 Dec 1881	Capt, 1st Art.
164	*Upton, Emory [4]	13 Mar 1865	15 Mar 1881	Died	15 Mar 1881	Capt, 5th Art.
165	Rawlins, John A. [4]	9 Apr 1865	2 May 1869	Resigned	6 Sep 1869	BG, C of Staff.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
166	Gillem, Alvan C. [3 4]	12 Apr 1865	2 Dec 1875	Died	2 Dec 1875	Capt, Ast QM.
167	*Morris, William W. [3 4]	10 Dec 1865	11 Dec 1865	Died	11 Dec 1865	Col, 2d Art.
168	*Cram, Thomas J. [3 4]	13 Jan 1866	22 Feb 1869	Retired	20 Dec 1883	Col, Engrs.
169	*Brown, Harvey [2 3 4]	2 Aug 1866	On retired list		31 May 1874	Col, Ret.
171	*Reynolds, Joseph J. [3 4]	2 Mar 1867	25 Jun 1877	Retired	25 Feb 1899	Col, 26th Inf.
172	*Willcox, Orlando B. [3 4]	2 Mar 1867	16 Apr 1887	Retired	10 May 1907	Col, 29th Inf.
173	Hatch, Edward [4]	2 Mar 1867	11 Apr 1889	Died	11 Apr 1889	Col, 9th Cav.
174	Grierson, Benjamin H. [4]	2 Mar 1867	8 Jul 1890	Retired	31 Aug 1911	Col, 10th Cav.
175	Pennypacker, Galusha [4]	2 Mar 1867	3 Jul 1883	Retired	1 Oct 1916	Col, 34th Inf.
176	Smith, John E. [4]	2 Mar 1867	19 May 1881	Retired	28 Jan 1897	Col, 27th Inf.
177	Miles, Nelson A. [4 5]	2 Mar 1867	5 Apr 1890	Aptd MG	15 May 1925	Col, 40th Inf.
178	Smith, Charles H. [4]	2 Mar 1867	1 Nov 1891	Retired	17 Jul 1902	Col, 28th Inf; MH.
179	Sickles, Daniel E. [4]	2 Mar 1867	14 Apr 1869	Aptd MG	3 May 1914	Col, 42d Inf.
180	Swayne, Wager [4]	2 Mar 1867	1 Jul 1870	Retired	18 Dec 1902	Col, 45th Inf; MH.
181	Rousseau, Lovell H. [3 4]	23 Mar 1867	7 Jan 1869	Died	7 Jan 1869	BG, US Army.
182	Otis, Elwell S. [4 5]	4 Feb 1899	16 Jun 1900	Aptd MG	21 Oct 1909	BG, US Army.
			BRIGADIER GENERALS			
1	Wilkinson, James [1 2]	6 Nov 1777	6 Mar 1778	Resigned	28 Dec 1825	Lt Col, Dep AG; Sec Bd War, 1778; Cloth Gen, 1779-81; BG, 1792.
2	De la Neuville, Noirmont [1]	14 Aug 1778	4 Dec 1778	Retired	— — —	Inspr.
3	Hazen, Moses [1]	29 Jul 1781	— Jun 1783	Retired	3 Feb 1803	Col, 2d Canad.
4	Thompson, William [1]	30 Sep 1783	3 Nov 1783	Hon Dis	22 Nov 1796	Col, 3d S. C.; Thanks of Congress.
5	Motte, Isaac [1]	30 Sep 1783	3 Nov 1783	Hon Dis	8 May 1795	Col, 2d S C.
6	Brodhead, Daniel [1]	30 Sep 1783	3 Nov 1783	Hon Dis	15 Nov 1809	Col, 1st Pa; Thanks of Congress.
7	Humpton, Richard [1]	30 Sep 1783	3 Nov 1783	Hon Dis	21 Dec 1804	Col, 2d Pa.
8	Van Cortlandt, Philip [1]	30 Sep 1783	3 Nov 1783	Hon Dis	5 Nov 1831	Col, 2d N Y.
9	Sheldon, Elisha [1]	30 Sep 1783	3 Nov 1783	Hon Dis	— — —	Col, 2d Drag.
10	Swift, Heman [1]	30 Sep 1783	— Dec 1783	Hon Dis	— — —	Col, Conn Bn.
11	Vose, Joseph [1]	30 Sep 1783	3 Nov 1783	Hon Dis	22 May 1816	Col, 1st Mass.
12	Jackson, Michael [1]	30 Sep 1783	3 Nov 1783	Hon Dis	10 Apr 1801	Col, 3d Mass.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
13	Ogden, Matthias [1]	30 Sep 1783	3 Nov 1783	Hon Dis	21 Mar 1791	Col, 1st N. J.
14	Crane, John [1]	30 Sep 1783	3 Nov 1783	Hon Dis	21 Aug 1805	Col, Art.
15	Baylor, George [1]	30 Sep 1783	3 Nov 1783	Hon Dis	— Mar 1784	Col, 1st Drag; Horse from Congress.
16	Webb, Samuel B. [1]	30 Sep 1783	30 Sep 1783	Hon Dis	3 Dec 1817	Ex-Col, 3d Conn.
17	Jackson, Henry [1]	30 Sep 1783	20 Jun 1784	Hon Dis	4 Jan 1809	Col, 4th Mass.
18	Mathews, George [1]	30 Sep 1783	3 Nov 1783	Hon Dis	30 Aug 1812	Col, 3d Va.
19	Gunby, John [1]	30 Sep 1783	15 Dec 1783	Hon Dis	— — —	Col, Md Bn.
20	Butler, Richard [1]	30 Sep 1783	3 Nov 1783	Hon Dis	4 Nov 1791	Col, 3d Pa; MG, U S Levies, 1791.
21	Nicola, Lewis [1]	30 Sep 1783	3 Nov 1783	Hon Dis	9 Aug 1807	Col, Invalid Regt.
22	Tupper, Benjamin [1]	30 Sep 1783	30 Sep 1783	Hon Dis	1 Jul 1792	Ex-Col, 6th Mass.
23	De Laumoy, —— [1]	30 Sep 1783	10 Oct 1783	Retired	— — —	Col, Engrs.
24	Neville, John [1]	30 Sep 1783	3 Nov 1783	Hon Dis	29 Jul 1803	Col, 4th Va.
25	Cobb, David [1]	30 Sep 1783	3 Nov 1783	Hon Dis	17 Apr 1830	Lt Col, 5th Mass.
26	Van Schaick, Goose [1]	10 Oct 1783	3 Nov 1783	Hon Dis	4 Jul 1787	Col, 1st N Y; Thanks of Congress.
27	Kosciuszko, Thaddeus [1]	13 Oct 1783	3 Nov 1783	Hon Dis	16 Oct 1817	Col, Engrs.
28	Moylan, Stephen [1]	3 Nov 1783	3 Nov 1783	Hon Dis	11 Apr 1811	Col, 4th Drag; Must Mast Gen, 1775; QM Gen, 1776.
29	Elbert, Samuel [1]	3 Nov 1783	3 Nov 1783	Hon Dis	2 Nov 1788	Col, 2d Ga.
30	Pinckney, Charles C. [1]	3 Nov 1783	3 Nov 1783	Hon Dis	16 Aug 1825	Col, 1st S C; MG, 1798.
31	Russell, William [1]	3 Nov 1783	3 Nov 1783	Hon Dis	— —— 1793	Col, 5th Va.
32	Harmar, Josiah [1]	31 Jul 1787	1 Jan 1792	Resigned	20 Aug 1813	Lt Col, 1st Inf; Cmdg Army, 1784-91.
33	Burbeck, Henry [1 2]	10 Jul 1812	15 Jun 1815	Hon Dis	2 Oct 1848	Col, Arts.
34	Porter, Moses [1 2]	10 Sep 1813	14 Apr 1822	Died	14 Apr 1822	Col, Lt Art.
35	Smith, Thomas A. [2]	24 Jan 1814	10 Nov 1818	Resigned	— Dec 1818	Col, Rifle Regt; BG, 1814.
36	Swift, Joseph G. [2]	19 Feb 1814	12 Nov 1818	Resigned	23 Jul 1865	Col, C of Engrs.
37	Bissell, Daniel [2]	9 Mar 1814	1 Jun 1821	Hon Dis	14 Dec 1833	Col, 1st Inf; BG, 1814.
38	Miller, James [2]	25 Jul 1814	1 Jun 1819	Resigned	7 Jul 1851	Col, 21st Inf; Medal from Congress.
39	Bernard, Simon	16 Nov 1816	10 Aug 1831	Resigned	5 Nov 1839	Ast Engr.
40	Atkinson, Henry [2]	13 May 1820	14 Jun 1842	Died	14 Jun 1842	Col, 6th Inf; BG, 1820.
41	Brady, Hugh [2 3]	6 Jul 1822	30 May 1848	Bvt MG	15 Apr 1851	Col, 2d Inf.
42	Fenwick, John R. [2]	18 Mar 1823	19 Mar 1842	Died	19 Mar 1842	Col, 4th Art.
43	Walbach, John de B. [2 3]	11 Nov 1823	10 Jun 1857	Died	10 Jun 1857	Maj, 1st Art.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
44	Leavenworth, Henry [2]	25 Jul 1824	21 Jul 1834	Died	21 Jul 1834	Lt Col, 6th Inf.
45	McNeil, John [2]	25 Jul 1824	23 Apr 1830	Resigned	23 Feb 1850	Lt Col, 3d Inf.
46	Brooke, George M. [2 3]	17 Sep 1824	30 May 1848	Bvt MG	9 Mar 1851	Lt Col, 4th Inf.
47	Wool, John E. [2 3 4]	29 Apr 1826	25 Jun 1841	Aptd BG	10 Nov 1869	Col, IG.
48	Gibson, George [2 3 4]	29 Apr 1826	30 May 1848	Bvt MG	29 Sep 1861	Com Gen.
49	*Gratiot, Charles [2]	24 May 1828	6 Dec 1838	Dismissed	18 May 1855	Col, C of Engrs.
50	*Armistead, Walter K. [2]	12 Nov 1828	13 Oct 1845	Died	13 Oct 1845	Col, 3d Art.
51	Clinch, Duncan L. [2]	20 Apr 1829	21 Sep 1836	Resigned	27 Nov 1849	Col, 4th Art.
52	Arbuckle, Matthew [2 3]	16 Mar 1830	11 Jun 1851	Died	11 Jun 1851	Col, 7th Art.
53	House, James [2]	8 May 1832	17 Nov 1834	Died	17 Nov 1834	Col, 1st Art.
54	Jones, Roger [2 3]	7 Jun 1832	30 May 1848	Bvt MG	15 Jul 1852	Col, Adjt Gen.
55	Eustis, Abraham [2]	30 Jun 1834	27 Jun 1843	Died	27 Jun 1843	Lt Col, 4th Art.
56	Towson, Nathan [2 3]	30 Jun 1834	30 May 1848	Bvt MG	20 Jul 1854	Col, PM Gen.
57	Taylor, Zachary [2 3]	25 Dec 1837	9 May 1846	Bvt MG	9 Jul 1850	Col, 1st Inf.
58	Worth, William J. [2 3]	1 Mar 1842	23 Sep 1846	Bvt MG	7 May 1849	Col, 8th Inf.
59	Smith, Persifor F. [3]	23 Sep 1846	20 Aug 1846	Bvt MG	17 May 1858	Col, Mtd Riflemen; BG, 1856.
60	Stanton, Henry [2 3]	1 Jan 1847	1 Aug 1856	Died	1 Aug 1856	Col, Ast QMG.
61	Churchill, Sylvester [2 3 4]	23 Feb 1847	25 Sep 1861	Retired	7 Dec 1862	Col, IG.
62	Whiting, Henry [2 3]	23 Feb 1847	16 Sep 1851	Died	16 Sep 1851	Col, Ast QMG.
63	Belknap, William G. [2 3]	23 Feb 1847	10 Nov 1851	Died	10 Nov 1851	Maj, 8th Inf.
64	Bankhead, James [2 3]	29 Mar 1847	11 Nov 1856	Died	11 Nov 1856	Col, 2d Art.
65	*Totten, Joseph G. [2 3 4]	29 Mar 1847	3 Mar 1863	Aptd BG	22 Apr 1864	Col, Engrs.
66	Clarke, Newman S. [2 3]	29 Mar 1847	17 Oct 1860	Died	17 Oct 1860	Col, 6th Inf.
67	Harney, William S. [3 4]	18 Apr 1847	14 Jun 1858	Aptd BG	9 May 1889	Col, 2d Drag.
68	Riley, Bennet [2 3]	18 Apr 1847	20 Aug 1847	Bvt MG	9 Jun 1853	Lt Col, 2d Inf.
69	Morgan, George W. [3 4]	20 Aug 1847	7 Aug 1848	Hon Dis	26 Jul 1893	Col, 15th Inf.
70	Garland, John [2 3 4]	20 Aug 1847	5 Jun 1861	Died	5 Jun 1861	Lt Col, 4th Inf.
71	*Hitchcock, Ethan [2 3 4]	8 Sep 1847	18 Oct 1855	Resigned	5 Aug 1870	Lt Col, 3d Inf.
72	Andrews, Timothy P. [2 3]	13 Sep 1847	29 Nov 1864	Resigned	11 Mar 1868	Col, Voltigeurs.
73	Trousdale, William [3]	13 Sep 1847	29 Jul 1848	Hon Dis	27 Mar 1872	Col, 14th Inf.
74	*Childs, Thomas [2 3]	12 Oct 1847	8 Oct 1853	Died	8 Oct 1853	Maj. 1st Art.
75	Lawson, Thomas [2 3 4]	30 May 1848	15 May 1861	Died	15 May 1861	Sur Gen.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
76	Mason, Richard B. [3]	30 May 1848	25 Jul 1850	Died	25 Jul 1850	Col, 1st Drag.
77	Talcott, George [3]	30 May 1848	10 Jul 1851	Dismissed	25 Apr 1862	Col, C of Ord.
78	*Johnston, Albert S. [3 4]	18 Nov 1857	3 May 1861	Resigned	6 Apr 1862	Col, 2d Cav (Gen, C S A)
79	*Mansfield, Joseph K. F. [3 4]	6 May 1861	14 May 1861	Aptd BG	18 Sep 1862	Col, IG.
80	*Thomas, Lorenzo [3 4]	7 May 1861	3 Aug 1861	Aptd BG	2 Mar 1875	Col, Ast AG.
81	*Ripley, James W. [2 3 4]	2 Jul 1861	3 Aug 1861	Aptd BG	15 Mar 1870	Lt Col, Ord.
82	*Brown, Harvey [2 3 4]	23 Nov 1861	1 Aug 1863	Retired	31 Mar 1874	Col, 5th Art; Bvt MG, 1866.
—	*Van Rensselaer, Henry [3]	23 Nov 1861	17 Jul 1862	Not Conf	23 Mar 1864	Col, IG.
83	*Heintzelman, Samuel P. [3 4]	31 May 1862	13 Mar 1865	Bvt MG	1 May 1880	Col, 17th Inf.
84	*Keyes, Erasmus D. [3 4]	31 May 1862	6 May 1864	Resigned	14 Oct 1895	Col, 11th Inf.
85	*Casey, Silas [3 4]	31 May 1862	13 Mar 1865	Bvt MG	22 Jan 1882	Col, 4th Inf.
86	*Morris, William W. [3 4]	9 Jun 1862	10 Dec 1865	Bvt MG	11 Dec 1865	Col, 2d Art.
87	*Porter, Fitz-John [3 4]	27 Jun 1862	21 Jan 1863	Cashier	21 May 1901	Col, 15th Inf.
88	*Franklin, William B. [3 4]	30 Jun 1862	13 Mar 1865	Bvt MG	8 Mar 1903	Col, 12th Inf.
89	*Thayer, Sylvanus [2 3 4]	31 May 1863	1 Jun 1863	Retired	7 Sep 1872	Col, Engrs.
90	*Allen, Robert [3 4]	4 Jul 1864	13 Mar 1865	Bvt MG	5 Aug 1886	Maj, QM.
91	Thomas, Charles [3 4]	5 Jul 1864	13 Mar 1865	Bvt MG	1 Feb 1878	Col, Ast QMG.
92	Rucker, Daniel H. [3 4]	5 Jul 1864	13 Mar 1865	Bvt MG	6 Jan 1910	Maj, QM; BG, 1882.
93	*Ingalls, Rufus [3 4]	6 Jul 1864	13 Mar 1865	Bvt MG	15 Jan 1893	Maj, QM; BG, 1893.
94	*Schriver, Edmund [3 4]	1 Aug 1864	13 Mar 1865	Bvt MG	10 Feb 1899	Col, IG.
95	Satterlee, Richard S. [3 4]	2 Sep 1864	22 Feb 1869	Retired	10 Nov 1880	Lt Col, C Med Pur.
96	*Shiras, Alexander E. [3 4]	17 Sep 1864	13 Mar 1865	Bvt MG	14 Apr 1875	Col, Ast Com Gen; BG, 1874.
97	*Donaldson, James L. [3 4]	17 Sep 1864	13 Mar 1865	Bvt MG	4 Nov 1885	Maj, QM.
98	*Easton, Langdon C. [3 4]	17 Sep 1864	13 Mar 1865	Bvt MG	20 Apr 1884	Maj, QM.
99	*Townsend, Edward D. [3 4]	24 Sep 1864	13 Mar 1865	Bvt MG	10 May 1893	Col, Ast AG; BG, 1869.
100	*Nichols, William A. [3 4]	24 Sep 1864	13 Mar 1865	Bvt MG	8 Apr 1869	Col, Ast AG.
101	*Hoffman, William [3 4]	7 Oct 1864	13 Mar 1865	Bvt MG	12 Aug 1884	Col, 3d Inf.
—	*Vinton, David H. [3 4]	28 Oct 1864	29 Apr 1865	Revoked	21 Feb 1873	Lt Col, Dep QMG; Bvt BG, 1865.
102	*Van Vliet, Stewart [3 4]	28 Oct 1864	13 Mar 1865	Bvt MG	28 Mar 1901	Maj, QM.
103	*Brice, Benjamin W. [3 4]	2 Dec 1864	13 Mar 1865	Bvt MG	4 Dec 1892	Col, PM Gen; BG, 1866.
104	*Wright, George [3 4]	19 Dec 1864	30 Jul 1865	Died	30 Jul 1865	Col, 9th Inf.
105	*Hill, Bennett H. [3 4]	31 Jan 1865	15 Dec 1870	Retired	24 Mar 1886	Lt Col, 5th Art.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
106	*Paul, Gabriel R. [3 4]	23 Feb 1865	On retired list		5 May 1886	Col, Ret; BG Ret, 1866.
107	*Hardie, James A. [3 4]	3 Mar 1865	13 Mar 1865	Bvt MG	14 Dec 1876	Col, IG.
108	*Gates, William [2 3 4]	13 Mar 1865	On retired list		7 Oct 1868	Col, Ret.
109	*Loomis, Gustavus [2 3 4]	13 Mar 1865	On retired list		5 Mar 1872	Col, Ret.
110	*Craig, Henry K. [2 3 4]	13 Mar 1865	On retired list		7 Dec 1869	Col, Ret; C of Ord, 1851-61.
111	Bonneville, Benj. L E. [2 3 4]	13 Mar 1865	On retired list		12 Jun 1878	Col, Ret.
112	*Seawell, Washington [3 4]	13 Mar 1865	On retired list		8 Jan 1888	Col, Ret.
113	Waite, Carlos A. [3 4]	13 Mar 1865	On retired list		7 May 1866	Col, Ret.
114	*Abercrombie, John J. [3 4]	13 Mar 1865	12 Jun 1865	Retired	3 Jan 1877	Col, 7th Inf.
115	Simonson, John S. [2 3 4]	13 Mar 1865	On retired list		5 Dec 1881	Col, Ret.
116	*Hunter, David [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	2 Feb 1866	Col, 6th Cav.
117	*Canby, Edward R. S. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	11 Apr 1863	Col, 17th Inf; BG, 1866.
118	Finley, Clement A. [3 4]	13 Mar 1865	On retired list		8 Sep 1879	Col, Ret; Sur Gen, 1861-62; Pay of BG, Ret, 1876.
119	Morrison, Pitcairn [3 4]	13 Mar 1865	On retired list		5 Oct 1887	Col, Ret.
120	Gardner, John L. [2 3 4]	13 Mar 1865	On retired list		19 Feb 1869	Col, Ret.
121	*Swords, Thomas [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	20 Mar 1886	Col, Ast QMG.
122	*Marcy, Randolph B. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	22 Nov 1887	Col, IG; BG, 1878.
123	*Merchant, Charles S. [2 3 4]	13 Mar 1865	On retired list		6 Dec 1879	Col, Ret.
124	*Sacket, Delos B. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	8 Mar 1885	Col, IG; BG, 1881.
125	*Cady, Albemarle [3 4]	13 Mar 1865	On retired list		14 Mar 1888	Col, Ret.
126	*Dimick, Justin [2 3 4]	13 Mar 1865	On retired list		13 Oct 1871	Col, Ret.
127	*Wood, Thomas J. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	25 Feb 1906	Col, 2d Cav; MG, 1868.
128	Blake, George A. H. [3 4]	13 Mar 1865	15 Dec 1870	Retired	27 Oct 1884	Col, 1st Cav.
129	*Day, Hannibal [3 4]	13 Mar 1865	On retired list		26 Mar 1891	Col, Ret.
130	Wood, Robert C. [3 4]	13 Mar 1865	— — 1869	Retired	28 May 1869	Col, Ast Sur Gen.
131	*Burbank, Sidney [3 4]	13 Mar 1865	1 May 1870	Retired	7 Dec 1882	Col, 2d Inf.
132	*Shepherd, Oliver L. [3 4]	13 Mar 1865	15 Dec 1870	Retired	15 Apr 1894	Col, 15th Inf.
133	*Crosman, George H. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	28 May 1882	Col, Ast QMG.
134	*DeRussy, René E. [2 3 4]	13 Mar 1865	23 Nov 1865	Died	23 Nov 1865	Col, Engrs.
135	*Bache, Hartman [2 3 4]	13 Mar 1865	7 Mar 1867	Retired	8 Oct 1872	Col, Engrs.
136	*Sherman, Thomas W. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	16 Mar 1879	Col, 3d Art.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
137	*Maynadier, William [3 4]	13 Mar 1865	3 Jul 1871	Died	3 Jul 1871	Col, Ord.
138	Butterfield, Daniel [4]	13 Mar 1865	13 Mar 1865	Bvt MG	17 Jul 1901	Col, 5th Inf.
139	*Brooks, Horace [3 4]	13 Mar 1865	10 Jan 1877	Retired	13 Jan 1894	Col, 4th Art.
140	*Burton, Henry S. [3 4]	13 Mar 1865	4 Apr 1869	Died	4 Apr 1869	Col, 5th Art.
141	*Thorton, William A. [3 4]	13 Mar 1865	6 Apr 1866	Died	6 Apr 1866	Col, Ord.
142	Greene, James D. [3 4]	13 Mar 1865	25 Jun 1867	Resigned	— — —	Col, 6th Inf.
143	*Emory, William H. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	1 Dec 1887	Col, 5th Cav; BG, 1876.
144	*Buchanan, Robert C. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	29 Nov 1878	Col, 1st Inf.
145	*Sibley, Caleb C. [3 4]	13 Mar 1865	22 Feb 1869	Retired	19 Feb 1875	Col, 16th Inf.
146	*Brewerton, Henry [2 3 4]	13 Mar 1865	7 Mar 1867	Retired	17 Apr 1879	Col, Engrs.
147	*Ketchum, William S. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	28 Jun 1871	Col, 11th Inf.
148	Graham, Lawrence P. [3 4]	13 Mar 1865	15 Dec 1870	Retired	12 Sep 1905	Col, 4th Cav.
149	*Bomford, James V. [3 4]	13 Mar 1865	8 Jun 1874	Retired	6 Jan 1892	Col, 8th Inf.
150	Dunn, William M. [4]	13 Mar 1865	1 Dec 1875	Aptd BG	24 Jul 1887	Col, Ast AG.
151	*Kilburn, Charles L. [3 4]	13 Mar 1865	20 May 1882	Retired	17 Mar 1899	Col, Ast Com Gen.
152	*Reeve, Isaac V. D. [3 4]	13 Mar 1865	1 Jan 1871	Retired	31 Dec 1890	Col, 13th Inf.
153	Mills, Madison [3 4]	13 Mar 1865	28 Apr 1873	Died	28 Apr 1873	Col, Med IG.
154	Lovell, Charles S. [3 4]	13 Mar 1865	15 Dec 1870	Retired	3 Jan 1871	Col, 14th Inf.
155	*Ruff, Charles F. [4]	13 Mar 1865	On retired list		1 Oct 1885	Lt Col, Ret.
156	*Vinton, David H. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	21 Feb 1873	Lt Col, Dep QMG.
157	*Babbitt, Edwin B. [3 4]	13 Mar 1865	29 Jul 1866	Retired	10 Dec 1881	Lt Col, Dep QMG.
158	Burke, Martin [3 4]	13 Mar 1865	On retired list		24 Apr 1882	Lt Col, Ret.
159	*Crier, William N. [3 4]	13 Mar 1865	15 Dec 1870		8 Jul 1885	Lt Col, 1st Cav.
160	Cuyler, John M. [3 4]	13 Mar 1865	31 Oct 1865	Hon Dis	26 Apr 1884	Lt Col, Med Inspr.
161	*Williams, Seth [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	23 Mar 1866	Lt Col, Ast AG.
162	Drum, Richard C. [3 4]	13 Mar 1865	15 Jun 1880	Aptd BG	15 Oct 1909	Lt Col, Ast AG.
163	Leonard, Hiram [3 4]	13 Mar 1865	1 Jan 1872	Retired	21 Dec 1883	Lt Col, Dep PMG.
164	Fry, James [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	11 Jul 1894	Lt Col, Ast AG.
165	*Simpson, Marcus D. L. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	7 Apr 1909	Lt Col, Ast Com Gen; BG, Ret, 1904.
166	*Cross, Osborne [3 4]	13 Mar 1865	29 Jul 1866	Retired	15 Jul 1876	Lt Col, Dep QMG.
167	Barnard, John G. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	14 May 1882	Lt Col, Engrs.
168	*Cullum, George W. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	28 Feb 1892	Lt Col, Engrs.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
169	*Benham, Henry W. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	1 Jun 1884	Lt Col, Engrs.
170	*Humphreys, Andrew A. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	27 Dec 1883	Lt Col, Engrs; BG, 1866.
171	King, John H. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	7 Apr 1888	Lt Col, 14th Inf.
172	*Whiteley, Robert H. K. [3 4]	13 Mar 1865	14 Apr 1875	Retired	9 Jun 1896	Lt Col, Ord.
173	*Hagner, Peter V. [3 4]	13 Mar 1865	1 Jun 1881	Retired	11 Mar 1893	Lt Col, Ord.
174	*Simpson, James H. [3 4]	13 Mar 1865	31 Mar 1880	Retired	2 Mar 1883	Lt Col, Engrs.
175	*Augur, Christopher C. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	16 Jan 1898	Lt Col, 12th Inf; BG, 1869.
176	*Dawson, Samuel L. [3 4]	13 Mar 1865	11 May 1870	Retired	17 Apr 1889	Lt Col, 15th Inf.
177	*Barry, William F. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	18 Jul 1879	Lt Col, 1st Art.
178	*Hunt, Henry J. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	11 Feb 1889	Lt Col, 3d Art.
179	*Roberts, Joseph [3 4]	13 Mar 1865	2 Jul 1877	Retired	18 Oct 1898	Lt Col, 4th Art.
180	*Steele, Frederick [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	12 Jan 1868	Lt Col, 3d Inf.
181	*Doubleday, Abner [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	26 Jan 1893	Lt Col, 17th Inf.
182	*Palmer, Innis N. [3 4]	13 Mar 1865	20 Mar 1879	Retired	10 Sep 1900	Lt Col, 2d Cav.
183	*Sykes, George [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	8 Feb 1880	Lt Col, 5th Inf.
184	*Sturgis, Samuel D. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	28 Sep 1889	Lt Col, 6th Cav.
185	*Clitz, Henry B. [3 4]	13 Mar 1865	1 Jul 1885	Retired	30 Oct 1888	Lt Col, 6th Inf.
186	*Slemmer, Adam J. [3 4]	13 Mar 1865	7 Oct 1868	Died	7 Oct 1868	Lt Col, 4th Inf.
187	*French, William H. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	20 May 1881	Lt Col, 2d Art.
188	Crawford, Samuel W. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	3 Nov 1892	Lt Col, 2d Inf; BG, Ret, 1875.
189	*Stoneman, George [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	5 Sep 1894	Lt Col, 3d Cav.
190	*Clary, Robert E. [3 4]	13 Mar 1865	22 Feb 1869	Retired	19 Jan 1890	Lt Col, Dep PMG.
191	*Sidell, William H. [4]	13 Mar 1865	15 Dec 1870	Retired	1 Jul 1873	Lt Col, 10th Inf.
192	*Smith, Andrew J. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	30 Jan 1897	Lt Col, 5th Cav.
193	*Hartsuff, George L. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	16 May 1874	Lt Col, Ast AG; MG, 1871.
194	*Clarke, Henry F. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	10 May 1887	Lt Col, Ast Com Gen.
195	*Woodruff, Israel C. [3 4]	13 Mar 1865	10 Dec 1878	Died	10 Dec 1878	Lt Col, Engrs.
196	*Wessells, Henry W. [3 4]	13 Mar 1865	1 Jan 1871	Retired	12 Jan 1889	Lt Col, 18th Inf.
197	*Leslie, Thomas J. [2 3 4]	13 Mar 1865	3 Feb 1869	Retired	25 Nov 1874	Maj, PM.
198	Tripler, Charles S. [3 4]	13 Mar 1865	20 Oct 1866	Died	20 Oct 1866	Maj, Surg.
199	McDougall, Charles [3 4]	13 Mar 1865	22 Feb 1869	Retired	25 Jul 1885	Maj, Surg.
200	Wright, Joseph J. B. [3 4]	13 Mar 1865	31 Dec 1876	Retired	14 May 1878	Maj, Surg.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
201	*Prince, Henry [3 4]	13 Mar 1865	31 Dec 1879	Retired	19 Aug 1892	Maj, PM.
202	Myer, Albert J. [3 4]	13 Mar 1865	16 Jun 1880	Aptd BG	24 Aug 1880	Maj, C Sig O.
203	*Roberts, Benjamin S. [3 4]	13 Mar 1865	15 Dec 1870	Retired	29 Jan 1875	Maj, 3d Cav.
204	*Miller, Morris S. [3 4]	13 Mar 1865	11 Mar 1870	Died	11 Mar 1870	Maj, QM.
205	Crane, Charles H. [3 4]	13 Mar 1865	3 Jul 1882	Aptd BG	10 Oct 1883	Maj, Surg.
206	Duncan, Thomas [3 4]	13 Mar 1865	15 Jan 1873	Retired	7 Jan 1887	Maj, 3d Cav.
207	*Burns, William W. [3 4]	13 Mar 1865	3 Sep 1889	Retired	19 Apr 1892	Maj, Com.
208	*Tower, Zealous B. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	20 Mar 1900	Maj, Engrs.
209	*Wright, Horatio G. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	2 Jul 1899	Maj, Engrs; BG, 1879.
210	*Newton, John [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	1 May 1895	Maj, Engrs; BG, 1884.
211	Carleton, James H. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	7 Jan 1873	Maj, 6th Cav.
212	*Granger, Robert S. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	25 Apr 1894	Maj, 5th Inf.
213	*Thom, George [3 4]	13 Mar 1865	20 Feb 1883	Retired	29 Jun 1891	Maj, Engrs.
214	*Beckwith, Amos [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	26 Oct 1894	Maj, Com.
215	Elliott, Washington L. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	29 Jun 1888	Maj, 1st Cav.
216	*Davis, Nelson H. [3 4]	13 Mar 1865	11 Mar 1885	Aptd BG	15 May 1890	Maj, Ast IG.
217	*Totten, James [3 4]	13 Mar 1865	22 Jul 1870	Dismissed	2 Oct 1871	Maj, Ast IG.
218	*Baird, Absalom [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	14 Jun 1905	Maj, Ast IG; BG, 1885.
219	*Davidson, John W. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	26 Jan 1881	Maj, 2d Cav.
220	*Ord, Edward O. C. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	22 Jul 1883	Maj, 4th Art; BG, 1865.
221	*Wallen, Henry D. [3 4]	13 Mar 1865	18 Feb 1874	Retired	2 Dec 1886	Maj, 7th Inf.
222	Hayden, Julius [3 4]	13 Mar 1865	6 May 1870	Retired	29 Oct 1878	Maj, 10th Inf.
223	*Pleasonton, Alfred [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	17 Feb 1897	Maj, 2d Cav.
224	Robinson, John C. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	18 Feb 1897	Maj, 2d Inf; MG, 1859.
225	*Haskin, Joseph A. [3 4]	13 Mar 1865	15 Dec 1870	Retired	3 Aug 1874	Maj, 3d Art.
226	*Sully, Alfred [3 4]	13 Mar 1865	27 Apr 1879	Died	27 Apr 1879	Maj, 8th Inf.
227	*Johnson, Richard W. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	21 Apr 1897	Maj, 4th Cav.
228	*Carr, Eugene A. [3 4]	13 Mar 1855	13 Mar 1865	Bvt MG	2 Dec 1910	Maj, 5th Cav; BG, 1892.
229	*Kelton, John C. [3 4]	13 Mar 1865	7 Jan 1889	Aptd BG	15 Jul 1893	Maj, Ast AG.
230	*Williams, Robert [3 4]	13 Mar 1865	5 Jul 1892	Aptd BG	24 Aug 1901	Maj, Ast AG.
231	*Whipple, William D. [3 4]	13 Mar 1865	13 Mar 1855	Bvt MG	1 Apr 1902	Maj, Ast AG.
232	*McKeever, Chauncey [3 4]	13 Mar 1865	31 Aug 1893	Retired	4 Sep 1901	Maj, Ast AG.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
233	*Ruggles, George D. [4]	13 Mar 1865	6 Nov 1893	Aptd BG	19 Oct 1904	Maj, Ast AG.
234	*Vincent, Thomas M. [4]	13 Mar 1865	15 Nov 1896	Retired	30 Nov 1909	Maj, Ast AG; BG, Ret, 1904.
235	*Greene, Oliver D. [4]	13 Mar 1865	25 Jan 1897	Retired	19 Mar 1904	Maj, Ast AG; MH.
236	*Breck, Samuel [4]	13 Mar 1865	11 Sep 1897	Aptd BG	23 Feb 1918	Maj, Ast AG.
237	*Haines, Thomas [3 4]	13 Mar 1865	14 Aug 1883	Died	14 Aug 1883	Maj, Com.
238	*Kirkham, Ralph W. [3 4]	13 Mar 1865	10 Feb 1870	Resigned	23 May 1893	Maj, QM.
239	*Kingsbury, Charles O. [3 4]	13 Mar 1865	31 Dec 1870	Retired	25 Dec 1879	Maj, Ord.
240	*Alexander, Barton S. [3 4]	13 Mar 1865	15 Dec 1878	Died	15 Dec 1878	Maj, Engrs.
241	*Raynolds, William F. [3 4]	13 Mar 1865	17 Mar 1884	Retired	19 Oct 1894	Maj, Engrs.
242	*Smith, William F. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	28 Feb 1903	Maj, Engrs.
243	*Foster, John G. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	2 Sep 1874	Maj, Engrs.
244	*Duane, James C. [3 4]	13 Mar 1865	11 Oct 1886	Aptd BG	8 Nov 1897	Maj, Engrs.
245	*Dent, Frederick T. [3 4]	13 Mar 1865	1 Dec 1883	Retired	23 Dec 1892	Maj, 4th Inf.
246	*Ricketts, James B. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	22 Sep 1887	Maj, 1st Art.
247	*Rodman, Thomas J. [3 4]	13 Mar 1865	7 Jun 1871	Died	7 Jun 1871	Maj, Ord.
248	*Gilmore, Quincy A. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	7 Apr 1888	Maj, Engrs.
—	*Prime, Frederick E. [3 4]	13 Mar 1865	13 Mar 1865	Declined	12 Aug 1900	Maj, Engrs.
249	*Hunt, Lewis C. [3 4]	13 Mar 1865	6 Sep 1886	Died	6 Sep 1886	Maj, 14th Inf.
250	*Potter, Joseph H. [3 4]	13 Mar 1865	1 Apr 1886	Aptd BG	1 Dec 1892	Maj, 19th Inf.
251	*Hays, William [3 4]	13 Mar 1865	7 Feb 1875	Died	7 Feb 1875	Maj, 5th Art.
252	*Getty, George W. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	1 Oct 1901	Maj, 5th Art.
253	*Brannan, John M. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	16 Dec 1892	Maj, 1st Art.
254	*Howe, Albion P. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	25 Jan 1897	Maj, 4th Art.
255	*Neill, Thomas H. [3 4]	13 Mar 1865	2 Apr 1883	Retired	12 Mar 1885	Maj, 11th Inf.
256	*Grover, Cuvier [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	6 Jun 1885	Maj, 3d Inf.
257	*Pitcher, Thomas G. [3 4]	13 Mar 1865	28 Jun 1878	Retired	19 Oct 1895	Maj, 16th Inf.
258	*Hatch, John P. [3 4]	13 Mar 1865	9 Jan 1886	Retired	12 Apr 1901	Maj, 4th Cav; MH.
259	*Garrard, Kenner [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	15 May 1879	Maj, 3d Cav.
260	Wheaton, Frank [4]	13 Mar 1865	13 Mar 1865	Bvt MG	18 Jun 1903	Maj, 2d Cav; BG, 1892.
261	*McFerran, John C. [3 4]	13 Mar 1865	25 Apr 1872	Died	25 Apr 1872	Maj, QM.
262	*Stanley, David S. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	13 Mar 1902	Maj, 5th Cav; BG, 1884.
263	*Beckwith, Edward S. [3 4]	13 Mar 1865	20 Mar 1879	Retired	22 Jun 1881	Maj, 2d Art.

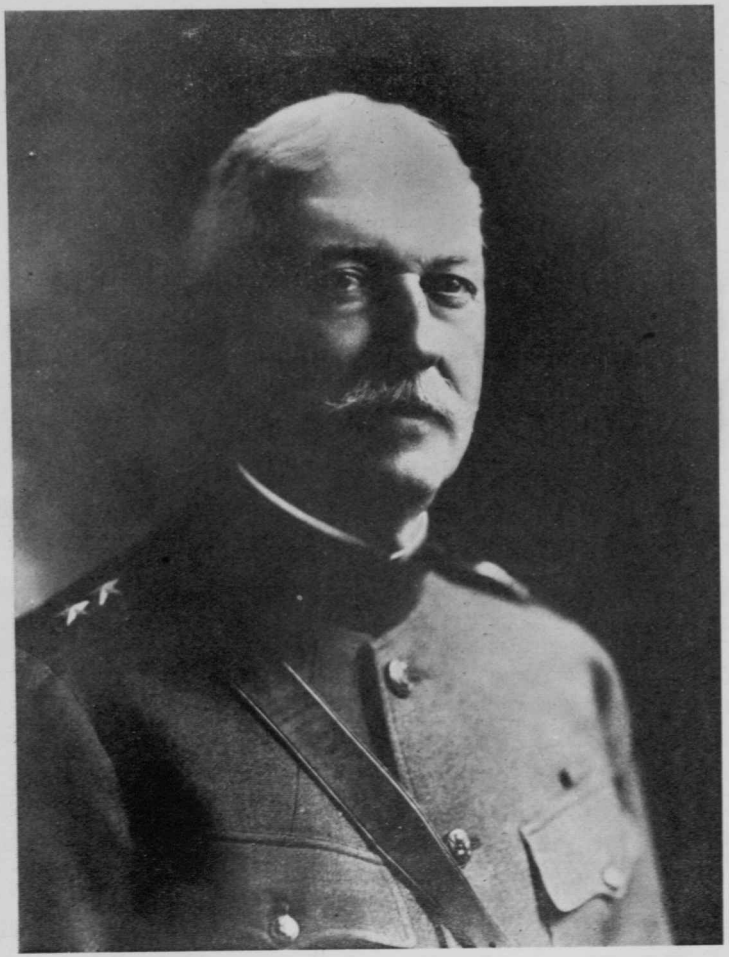
NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
264	*Carlin, William P. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	5 Oct 1903	Maj, 16th Inf; BG, 1893.
265	*Pelouze, Louis H. [4]	13 Mar 1865	2 Jun 1878	Died	2 Jun 1878	Maj, Ast AG.
266	*Woods, Charles R. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	26 Feb 1885	Maj, 18th Inf.
267	*Eaton, Joseph H. [3 4]	13 Mar 1865	24 Jan 1881	Retired	20 Jan 1896	Maj, PM.
268	*Parke, John G. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	16 Dec 1900	Maj, Engrs.
269	*Warren, Gouverneur K. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	8 Aug 1882	Maj, Engrs.
270	*Myers, Frederick [3 4]	13 Mar 1865	7 Jul 1874	Died	7 Jul 1874	Maj, QM.
271	*Mason, John S. [3 4]	13 Mar 1865	21 Aug 188	Retired	29 Nov 1897	Maj, 17th Inf.
272	DeRussy, Gustavus A. [3 4]	13 Mar 1865	3 Nov 1882	Retired	29 May 1891	Capt, 3d Art.
273	*Moore, Tredwell [3 4]	13 Mar 1865	29 May 1876	Died	29 May 1876	Capt, Ast QM.
274	*Gibbon, John [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	6 Feb 1896	Capt, 4th Art; BG, 1885.
275	*Seymour, Truman [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	30 Oct 1891	Capt, 5th Art.
276	*Griffin, Charles [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	15 Sep 1867	Capt, 5th Art.
277	*Granger, Gordon [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	10 Jan 1876	Capt, 3d Cav.
278	*Sweitzer, Nelson B. [4]	13 Mar 1865	29 Oct 1888	Retired	7 Mar 1898	Capt, 1st Cav.
279	*Lowe, William W. [4]	13 Mar 1865	22 Jun 1869	Resigned	18 May 1898	Capt, 5th Cav.
280	*Gibbs, Alfred [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	26 Dec 1868	Capt, 3d Cav.
281	*Holabird, Samuel B. [3 4]	13 Mar 1865	1 Jul 1883	Aptd BG	3 Feb 1907	Capt, Ast QM.
282	Davis, Jefferson C. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	30 Nov 1879	Capt, 1st Art.
283	*Ayres, Romeyn B. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	4 Dec 1888	Capt, 5th Art.
284	Robertson, James M. [3 4]	13 Mar 1865	20 Mar 1879	Retired	24 Jan 1891	Capt, 2d Art.
285	*Tidball, John C. [3 4]	13 Mar 1865	25 Jan 1889	Retired	15 May 1906	Capt, 2d Art; BG, Ret, 1904.
286	*Arnold, Richard [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	8 Nov 1882	Capt, 5th Art.
287	*Marshall, Elisha G. [3 4]	13 Mar 1865	11 Sep 1867	Retired	3 Aug 1883	Capt, 6th Inf.
288	*Kautz, August V. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	4 Sep 1895	Capt, 6th Cav; BG, 1891.
289	*Crook, George [4]	13 Mar 1865	13 Mar 1865	Bvt MG	21 Mar 1890	Capt, 4th Inf; BG, 1873.
290	*McCook, Alexander M. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	12 Jun 1903	Capt, 3d Inf; BG, 1890.
291	McKibbin, David [3 4]	13 Mar 1865	31 May 1875	Retired	8 Nov 1890	Capt, 14th Inf.
292	*Hazen, William B. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	16 Jan 1887	Capt, 8th Inf; BG, 1880.
293	*Webb, Alexander S. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	— — —	Capt, 11th Inf.
294	Gregg, John I. [3 4]	13 Mar 1865	2 Apr 1879	Retired	6 Jan 1892	Capt, 6th Cav.
295	Fessenden, Francis [4]	13 Mar 1865	13 Mar 1865	Bvt MG	2 Jan 1906	Capt, 19th Inf; BG, 1866.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
296	*Perry, Alexander J. [3 4]	13 Mar 1865	11 Dec 1892	Retired	26 Mar 1913	Capt, Ast QM; BG, Ret, 1904.
297	*Tyler, Robert O. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	1 Dec 1874	Capt, Ast QM.
298	*Myers, William [4]	13 Mar 1865	15 Mar 1883	Retired	11 Nov 1887	Capt, Ast QM.
299	*Sawtelle, Charles G. [4]	13 Mar 1865	19 Aug 1896	Apt BG	4 Jan 1913	Capt, Ast QM.
300	Long, Eli [4]	13 Mar 1865	13 Mar 1865	Bvt MG	5 Jan 1903	Capt, 4th Cav; BG, Ret, 1875.
301	*Gillem, Alvan C. [3 4]	13 Mar 1865	12 Apr 1865	Bvt MG	2 Dec 1875	Capt, Ast QM.
302	Dana, James J. [4]	13 Mar 1865	9 Apr 1885	Retired	15 Sep 1888	Capt, Ast QM.
303	*Hawkins, John P. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	7 Feb 1914	Capt, Com; BG, 1892.
304	*Barriger, John W. [4]	13 Mar 1865	1 Jun 1896	Retired	31 Dec 1906	Capt, Com; BG, Ret, 1904.
305	*Turner, John W. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	8 Apr 1899	Capt, Com.
306	Thomas, Henry G. [4]	13 Mar 1865	2 Jul 1891	Retired	23 Jan 1897	Capt, 11th Inf.
307	Mower, Joseph A. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	6 Jan 1870	Capt, 1st Inf.
308	*Torbert, Alfred T. A. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	29 Aug 1880	Capt, 5th Inf.
309	Card, Benjamin C. [4]	13 Mar 1865	15 Feb 1889	Retired	14 Feb 1916	Capt, Ast QM.
310	Potter, Joseph A. [4]	13 Mar 1865	21 Apr 1879	Retired	21 Apr 1888	Capt, Ast QM.
311	*Wilson, Thomas [4]	13 Mar 1865	10 Jun 1896	Retired	30 May 1901	Capt, Com.
312	Graham, William M. [3 4]	13 Mar 1865	26 May 1897	Apt BG	11 Jan 1916	Capt, 1st Art.
313	*Carroll, Samuel S. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	28 Jan 1892	Capt, 10th Inf.
314	Tompkins, Charles H. [3 4]	13 Mar 1865	12 Sep 1894	Retired	18 Jan 1915	Capt, Ast QM; BG, Ret, 1904; MH.
315	Jackson, Richard H. [4]	13 Mar 1865	28 Nov 1892	Died	28 Nov 1892	Capt, 1st Art.
316	Dandy, George B. [3 4]	13 Mar 1865	11 Feb 1894	Retired	14 Jan 1911	Capt, Ast QM.
317	*Merritt, Wesley [4 5]	13 Mar 1865	13 Mar 1865	Bvt MG	3 Dec 1910	Capt, 2d Cav; BG, 1887.
318	*Abbot, Henry L. [4]	13 Mar 1865	13 Aug 1895	Retired	1 Oct 1927	Capt, Engrs; BG, Ret, 1904.
319	McLaughlen, Napoleon B. [4]	13 Mar 1865	26 Jun 1882	Retired	27 Jan 1887	Capt, 4th Cav.
320	*Averell, William W. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	3 Feb 1900	Capt, 3d Cav.
321	Rodenbough, Theophilus F. [4]	13 Mar 1865	15 Dec 1870	Retired	19 Dec 1912	Capt, 2d Cav; BG, Ret, 1901; MH.
322	Watkins, Louis D. [4]	13 Mar 1865	29 Mar 1868	Died	29 Mar 1868	Capt, 5th Cav.
323	*Morgan, Charles H. [4]	13 Mar 1865	20 Dec 1875	Died	20 Dec 1875	Capt, 4th Cav.
324	*Comstock, Cyrus B. [4]	13 Mar 1865	3 Feb 1895	Retired	29 May 1910	Capt, Engrs; BG, Ret, 1904.
325	*Weitzel, Godfrey [4]	13 Mar 1865	13 Mar 1865	Bvt MG	19 Mar 1884	Capt, Engrs.
326	*Poe, Orlando M. [4]	13 Mar 1865	2 Oct 1895	Died	2 Oct 1895	Capt, Engrs.
327	*Porter, Horace [4]	13 Mar 1865	31 Dec 1873	Resigned	— — —	Capt, Ord; MH.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
328	*Reese, Chauncey B. [4]	13 Mar 1865	22 Sep 1870	Died	22 Sep 1870	Capt, Engrs.
329	Ekin, James A. [1]	13 Mar 1865	31 Aug 1883	Retired	27 Mar 1891	Capt, Ast QM.
330	*Wilson, James H. [4 5]	13 Mar 1865	13 Mar 1865	Bvt MG	23 Feb 1925	Capt, Engrs; BG, 1901.
331	*Babcock, Orville E. [4]	13 Mar 1865	2 Jun 1884	Died	2 Jun 1884	Capt, Engrs.
332	*Mackenzie, Ranald S. [4]	13 Mar 1865	26 Oct 1882	Apt BG	19 Jan 1889	Capt, Engrs.
333	McIntosh, John B. [3 4]	13 Mar 1865	13 Mar 1865	Bvt MG	29 Jun 1888	Capt, 5th Cav; BG, 1870.
334	*Custer, George A. [4]	13 Mar 1865	13 Mar 1865	Bvt MG	25 Jun 1876	Capt, 5th Cav.
335	*Ames, Adelbert [4 5]	13 Mar 1865	13 Mar 1865	Bvt MG	— — —	Capt, 5th Art.
336	*Kilpatrick, Judson [4]	13 Mar 1865	13 Mar 1865	Bvt MG	2 Dec 1881	Capt, 1st Art.
337	*Upton, Emory [4]	13 Mar 1865	13 Mar 1865	Bvt MG	15 Mar 1881	Capt, 5th Art.
338	*Hardin, Martin D. [4]	13 Mar 1865	15 Dec 1870	Apt BG	12 Dec 1923	1st Lt, 3d Art.
339	Fitzhugh, Charles L. [4]	13 Mar 1865	13 May 1865	Resigned	— — —	1st Lt, 4th Art.
340	McCook, Edward M. [4]	13 Mar 1865	9 May 1866	Resigned	— — —	1st Lt, 4th Cav.
341	*Palfrey, John C. [4]	26 Mar 1865	1 May 1866	Resigned	— — —	Capt, Engrs.
342	*Oakes, James [3 4]	30 Mar 1865	20 Apr 1879	Retired	27 Nov 1910	Lt Col, 4th Cav.
343	Townsend, Frederick [4]	30 Mar 1865	26 Mar 1868	Resigned	11 Sep 1897	Lt Col, 9th Inf.
344	*Michler, Nathaniel [3 4]	2 Apr 1865	17 Jul 1881	Died	17 Jul 1881	Maj, Engrs.
345	*Vogdes, Israel [3 4]	9 Apr 1865	2 Jan 1881	Retired	7 Dec 1889	Col, 1st Art.
346	*Alvord, Benjamin [3 4]	9 Apr 1865	22 Jul 1876	Apt BG	16 Oct 1884	Maj, PM.
347	*Smith, Joseph R. [3 4]	9 Apr 1865	On retired list		3 Sep 1868	Maj, Ret.
348	*Callender, Frank D. [3 4]	9 Apr 1865	29 May 1879	Retired	13 Dec 1882	Maj, Ord.
349	Bowers, Theodore S. [4]	9 Apr 1865	6 Mar 1866	Died	6 Mar 1866	Maj, Ast AG.
350	*Saxton, Rufus [3 4]	9 Apr 1865	19 Oct 1888	Retired	23 Feb 1908	Capt, Ast QM; BG, Ret, 1904; MH.
351	*Bingham, Judson D. [4]	9 Apr 1865	10 May 1895	Retired	17 Nov 1909	Capt, Ast QM; BG, Ret, 1904.
352	*Bell, George [4]	9 Apr 1865	12 Mar 1892	Retired	2 Jan 1907	Capt, Com; BG, Ret, 1904.
353	*Morgan, Michael R. [4]	9 Apr 1865	8 Oct 1894	Apt BG	16 Sep 1911	Capt, Com.
354	*Small, Michael P. [4]	9 Apr 1865	1 Aug 1892	Died	1 Aug 1892	Capt, Com.
355	*Forsyth, James W. [4]	9 Apr 1865	9 Nov 1894	Apt BG	24 Oct 1906	Capt, 18th Inf.
356	*McAlester, Miles D. [4]	9 Apr 1865	23 Apr 1869	Died	23 Apr 1869	Capt, Engrs.
357	Penrose, William H. [4]	9 Apr 1865	10 Mar 1896	Retired	29 Aug 1903	Capt, 3d Inf.
358	*Warner, James M. [4]	9 Apr 1865	13 Feb 1866	Resigned	16 Mar 1897	Capt, 8th Inf.
359	Alexander, Andrew J. [4]	16 Apr 1865	3 Jul 1885	Retired	4 May 1887	Capt, 8th Cav.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
360	*Alexander, Edmund B. [3 4]	18 Oct 1865	22 Feb 1869	Retired	3 Jan 1888	Col, 10th Inf.
361	*Cram, Thomas J. [3 4]	13 Jan 1866	13 Jan 1866	Bvt MG	20 Dec 1883	Col, Engrs.
362	*Eastman, Seth [3 4]	9 Aug 1866	On retired list		31 Aug 1875	Lt Col, Ret.
363	Sloan, William J. [3 4]	28 Sep 1866	17 Mar 1880	Died	17 Mar 1880	Maj, Surg.
364	Brown, Joseph B. [4]	28 Sep 1866	26 Jul 1886	Retired	21 Oct 1891	Maj, Surg.
365	Milhau, John J. [4]	28 Sep 1866	1 Oct 1876	Resigned	8 May 1891	Maj, Surg.
366	McParlin, Thomas A. [4]	26 Nov 1866	10 Jul 1889	Retired	28 Jan 1897	Maj, Surg.
367	*Reynolds, Joseph J. [3 4]	2 Mar 1867	2 Mar 1867	Bvt MG	25 Feb 1899	Col, 26th Inf.
368	*Willcox, Orlando B. [3 4]	2 Mar 1867	2 Mar 1867	Bvt MG	10 May 1907	Col, 29th Inf; BG, 1886.
369	*Ruger, Thomas H. [4]	2 Mar 1867	19 Mar 1886	Apt BG	3 Jun 1907	Col, 33d Inf.
370	Hatch, Edward [4]	2 Mar 1867	2 Mar 1867	Bvt MG	11 Apr 1889	Col, 9th Cav.
371	Crierson, Benjamin H. [4]	2 Mar 1867	2 Mar 1867	Bvt MG	31 Aug 1911	Col, 10th Cav; BG, 1890.
372	Pennypacker, Galusha [4]	2 Mar 1867	2 Mar 1867	Bvt MG	1 Oct 1916	Col, 34th Inf; BG, Ret, 1904.
373	Stevenson, John D. [3 4]	2 Mar 1867	1 Jan 1871	Hon Dis	22 Jan 1897	Col, 30th Inf.
374	Smith, John E. [4]	2 Mar 1867	2 Mar 1867	Bvt MG	29 Jan 1897	Col, 27th Inf.
375	Miles, Nelson A. [4 5]	2 Mar 1867	2 Mar 1867	Bvt MG	15 May 1925	Col, 40th Inf; BG, 1880.
376	DeTrobriand, Philip R. [4]	2 Mar 1867	20 Mar 1879	Retired	15 Jul 1897	Col, 31st Inf.
377	Smith, Charles H. [4]	2 Mar 1867	2 Mar 1867	Bvt MG	17 Jul 1902	Col, 28th Inf.
378	Crittenden, Thomas L. [3 4]	2 Mar 1867	19 May 1881	Retired	23 Oct 1893	Col, 32d Inf.
379	Sickles, Daniel E. [4]	2 Mar 1867	2 Mar 1867	Bvt MG	3 May 1914	Col, 42d Inf; MG, 1869.
380	Swayne, Wager [4]	2 Mar 1867	2 Mar 1867	Bvt MG	18 Dec 1902	Col, 45th Inf.
381	Devin, Thomas C. [4]	2 Mar 1867	4 Apr 1878	Died	4 Apr 1878	Lt Col, 8th Cav.
382	Brooke, John R. [4 5]	2 Mar 1867	6 Apr 1888	Apt BG	5 Sep 1926	Lt Col, 37th Inf.
383	Hinks, Edward W. [4]	2 Mar 1867	15 Dec 1870	Retired	14 Feb 1894	Lt Col, 40th Inf.
384	Bradley, Luther P. [4]	2 Mar 1867	8 Dec 1886	Retired	13 Mar 1910	Lt Col, 27th Inf; BG, Ret, 1904.
385	Buell, George P. [4]	2 Mar 1867	31 May 1883	Died	31 May 1883	Lt Col, 29th Inf.
386	Kiddoo, Joseph B. [4]	2 Mar 1867	15 Dec 1870	Apt BG	19 Aug 1880	Lt Col, 43d Inf.
387	Ihrie, George P. [3 4]	2 Mar 1867	1 Jul 1873	Resigned	26 Feb 1903	Maj, PM.
388	Badeau, Adam [4]	2 Mar 1867	18 May 1869	Retired	19 Mar 1895	1st Lt, 4th Inf.
389	Parker, Ely S. [4]	2 Mar 1867	26 Apr 1869	Resigned	30 Aug 1895	2d Lt. 2d Cav.
390	Swift, Ebenezer [3 4]	20 Jul 1867	8 Oct 1883	Retired	24 Dec 1885	Maj, Surg.
391	Brown, Nathan W. [4]	15 Oct 1867	8 Jun 1880	Apt BG	4 Mar 1893	Col, Ast PMG.

NO.	NAME	APPOINTED	VACATED		DIED	REMARKS
			DATE	CAUSE		
—	*McClure, Daniel [3 4]	15 Oct 1867	4 Mar 1869	Not Conf	31 Oct 1900	Col, Ast PMG.
392	*Fry, Cary H. [3 4]	15 Oct 1867	5 Mar 1873	Died	5 Mar 1873	Lt Col, Dep PMG.
393	Forsyth, George A. [4]	17 Sep 1868	25 Mar 1890	Retired	12 Sep 1915	Maj, 9th Cav.
394	*Bankhead, Henry C. [4]	1 Oct 1868	12 Nov 1879	Retired	9 Jan 1894	Capt, 5th Inf.
395	Mason, Edwin C. [4]	27 Feb 1890	31 May 1895	Retired	30 Apr 1898	Col, 3d Inf.
396	*Evans, Andrew W. [4]	27 Feb 1890	On retired list		24 Apr 1906	Lt Col, Ret.
397	Green, John [3 4]	27 Feb 1890	On retired list		22 Nov 1908	Lt Col, Ret; Mil.
398	*Merrill, Lewis [4]	27 Feb 1890	On retired list		27 Feb 1896	Lt Col, Ret.
399	*Henry, Guy V. [1 5]	27 Feb 1890	11 Oct 1898	Apt BG	27 Oct 1899	Maj, 9th Cav.
400	Bernard, Reuben F. [1]	27 Feb 1890	14 Oct 1896	Retired	17 Nov 1903	Maj, 8th Cav.
401	Benteen, Frederick W. [4]	27 Feb 1890	On retired list		22 Jun 1898	Maj, Ret.



Colonel Frederick S. Strong

Commandant, Coast Artillery School, September 8, 1911 – February 27, 1913

EDITORIAL

Annual Prize Essay

THE JOURNAL desires again to invite the attention of its readers to the annual prize essay competition. This is the eighteenth consecutive year in which the JOURNAL has offered a prize for essays contributed by its readers, and never have the requirements been easier to meet. The subject must bear upon some phase of tactics or technique involved in the efficient accomplishment of the mission of Coast Artillery. With this sole limitation the competitor is free to choose his topic and his angle of approach.

The only novelty in the competition this year is the offer of three prizes, instead of two as heretofore. In case of a tie, the awards will be divided equally among the tying contestants. For example, the second and third prizes will be divided equally between two contestants tying for second place.

With no desire to restrict individual choice of subject, the JOURNAL offers the following general questions as suggestive of ideas worthy of discussion: Will the roads now being built throughout the United States be adequate for the movements of motorized artillery and ammunition colums in time of war? To what extent is the railroad net of this country suited to the wartime movement and employment of railway artillery, praticularly in coast defense. What will be the atniaircraft gun of future wars? How will isolated fixed artillery batteries—as on an island—be supplied in time of war? How will the details of coast artillery command in coast defense vary (if at all) before and after the mobile army moves into the sector? Has the problem of control of long-range fire at mobile targets been completely and satisfactorily solved? How do present and prospective improvements in radio affect the service of coast artillery? To what extent will sound ranging be of value in service in the field? What part will heavy mobile artillery play in the defense of unfortified sections of the coast? What improvements are necessary in guns, carriages, searchlights, sound locators, ammunition, heavy artillery, motor vehicles, fire control instruments, submarine mining, etc., and how are they to be developed?

The list can be extended almost indefinitely, and each item offers several possibilities. Surely, each of the JOURNAL readers has some novel thought on some phase of coast artillery service. Send in what you have—two or three articles, if you wish—and see what the Committee of Award will have to say.

PROFESSIONAL NOTES

The 64th Coast Artillery (Antiaircraft)

The Coat of Arms of the 64th Coast Artillery (AA) was approved by the War Department on March 8, 1922; and its blazonry is:

Shield: *Gules* (red) an inescutcheon barry of eight *argent* (silver) of the field (red) and *azure* (blue) repeated.

Crest: On a wreath of the colors (silver and red) a round of antiaircraft artillery ammunition *gules* (red) winged *or* (gold).

Motto: We aim high.

The shield is red for artillery and bears as an inescutcheon, the first quarter of the Royal Hawaiian coat of arms. The crest and motto are self-explanatory.

The regiment was organized in 1921 as the Hawaiian Antiaircraft Regiment, and was composed of Headquarters Battery, Service Battery, Headquarters Detachment and Combat Train, 1st Battalion, Batteries A, B, C, D, E, F, G, and H. Headquarters Detachment and Combat Train, 2d Battalion, was organized in 1922, and all units were given additional numbers from 263 to 274, inclusive, Coast Artillery Corps. Battery I and Headquarters Detachment and Combat Train, 3d Battalion, were added in 1925. The regimental desgination was changed in 1922 to 64th Artillery Regiment (AA) and in 1924 to 64th Coast Artillery.

The personnel of the organization wears the crest without the wreath as a distinctive regimental badge on its uniform.

Correction Index for AA Data Computer, Model 1917

By CAPT. C. W. WAHLE. *212th C. A.*

The device here described was designed to facilitate the setting of arbitrary corrections on the A. A. Data Computer, Model 1917 (R. A. Corrector), and to reduce the chance of error in the work of the vertical deflection reader, No. 3. It can be used, also, to set the lateral correction, determined from the Trial Shot Problem, on the lateral deflection speedometer dial.

This device, as shown in the accompanying diagram, can be constructed locally at very small cost.

It consists of a small bolt or screw upon which the following are threaded, in order: a small soft rubber washer, a nut, a wire index, two small metal washers, and a nut.

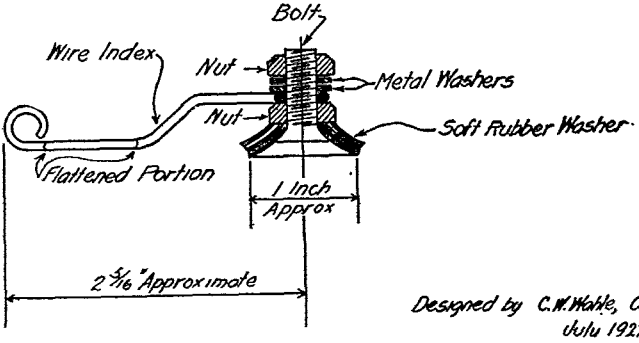
The nut next to the rubber washer is turned down until the washer conforms to the slope of the screw-head, forming a "sucker." The rubber washer must not be so large as to obscure the black and red shutter in the speedometer dial.

The index is made of wire bent as shown in the diagram. The end is bent into a loop, forming a handle to facilitate operation. That portion of the wire in contact with the glass cover of the speedometer dial is flattened on both sides to facilitate reading and setting. The inner end is bent into a loop, and threaded

on the bolt. The index wire must be long enough to extend over the mil scales, but not so long as to strike the dial operating knob.

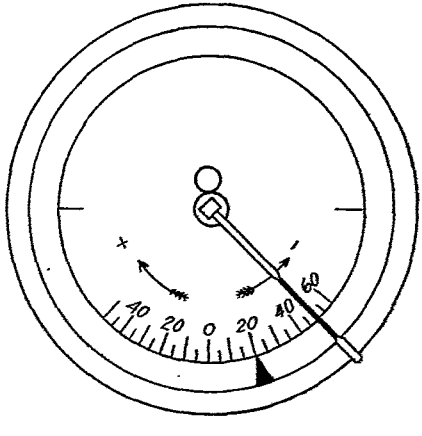
Two washers are used to reduce the friction between the index and the outer nut, as it was found that, using only one washer, the nut had a tendency to "back off" when the index was rotated.

Correction Index for AA Data Computer, Mod. 1917



The outer nut not only holds the assembly together, but is used to obtain the friction necessary to retain the index in any position.

The bottom of the rubber washer having been "doped" with a good cement, the device is placed on the glass over the center of the speedometer dial and the cement permitted to dry. The writer has found a cement called "Tilette" to be



Wire Pointer Set at -50 Correction Index at +30 (Relative to Pointer)

satisfactory. Should the rubber washer become torn, it can be easily and cheaply replaced, as they retail at five cents per dozen.

With our present equipment (R. A. Corrector), No. 3 is required to read the value of the complementary term, add to it algebraically the vertical deflection correction for wind, set the combined correction on the verticle deflection speedom-

eter dial, read the corrected vertical deflection to No. 5 and (by phone) to the guns, and set this reading on the dead-time cylinder.

Corrections are set on a dial by moving an index on the movable scale past a fixed mil scale on the bottom of the speedometer dial.

If the index wire is set over the value of the complementary term, the secondary corrections determined by the wind computer can be set off using the wire as zero. This renders mental arithmetic by No. 3 unnecessary.

The lateral correction as determined from the trial shot problem is similarly set. This has the advantage of setting the correction at the source of the firing data, rather than setting it on the gun sights.

Arbitrary connections are applied to the R. A. Corrector by setting the index wire the desired amount in the desired direction, and using the wire as zero for the setting of the customary secondary corrections.

The lateral correction as determined from the Trial Shot Problem can be chalked on the face of the R. A. Corrector, so that it can be re-set when the necessity for the arbitrary correction has passed.

British Test Mechanization

Whether or not the British will continue the mechanization of their army is understood to depend largely upon the results of the various experiments and maneuvers which have been taking place upon Salisbury Plain, England.

In recent maneuvers of the newly formed Mechanized Force, with the 7th Infantry Brigade, several Cavalry units, and the Royal Air Force, some very reasonable results have been claimed. The outstanding of these is the definite establishment of the one-man tank or "tankette" as a vital factor in all military arms connected with reconnaissance.

Night maneuvers have been carried on against both Infantry, Air Force, and Cavalry by a Mechanized Force of well over 200 vehicles and 4000 men.

Through weather so bad that night flying was impossible and the Cavalry was forced to suspend operations, the "iron horses" set out upon their mission covering a line of march of seven miles. Every unit was completely motorized and armored, the entire outfit proceeding without lights in blinding rain and fog keeping in touch with one another by means of "radio-vans" sprinkled at approprate intervals throughout the command.

Big "dragon" tanks with 60 pounders and lesser "dragons" capable of carrying 18 pounders and 172 shells together with a crew of 12 men were used as the main attacking body which was backed up by the larger guns on self-propelled mounts. There were 48 of these large tanks.

By far the most interesting development was the remarkable mobility exhibited by the tiny "tankettes," which, in realty, are nothing short of self-controlled machine-gun nests on caterpillars. These little tanks which are entirely one-man affairs have definitely established themselves as vital, in the opinion of the British, by their demonstration.

If this summer's experiments and demonstrations fully bear out the claims which have been advanced by their sponsors, it is definitely predicted by English Military Authorities that the mechanization of the British Army will proceed with as much speed and dispatch as is possible.—*Army and Navy Journal.*

The Experimental Mechanized Force

Units of the Eperimental Mechanized Force were engaged on Aug. 31 in an operation designed to test the value of "motorized" troops in a punitive raid against Asiatics. The River Avon was the frontier line, east of which was the tribal territory. Across the river to the westward a native raiding force—the 1st Battalion The Duke of Wellington's Regiment, the 1st Battalion The Prince of Wales' Volunteers, a cavalry squadron (of gunners), and two batteries of the 6th Field Brigade, R. A.—entered British territory and captured the village of Tilshead. It then fell back towards Sidbury Hill, a native frontier fort.

When news of the attack on Tilshead reached British headquarters the Mechanized Force was set on the move, and had advanced to Alton Down by 4:00 a. m. Here it halted for seven hours, during which period it was inspected by Mr. Winston Churchill, Chancellor of the Exchequer, one of the early begetters of the tank. For the next stage of the advance Colonel Pile, commanding the punitive force, decided to divide his troops into three columns with the hope of rounding up the raiders before they reached Sidbury Hill and relative security. The two wing columns, one composed of Carden-Loyd tankettes, armored cars, a Light Battery, R. A., in Karrier six-wheelers, and The Cheshire Regiment's motor machine guns, and the other of Morris-Martel tankettes, The Somerset Light Infantry in motor vehicles, and a number of armoured cars, were intended to make wide encircling movements with the intention of intercetping the raiders. The center column of tanks was to chase the raiders and make the final attack.

One bridge had been destroyed by the raiders and the four others had been sprayed with mustard gas and blocked. At each bridgehead riflemen and Lewis gunners remained to harass the advancing troops. Sappers in respirator, covered by machine-gun fire, cleared the bridges. These operations delayed the advance—in the case of the left wing column by 48 minutes. An air attack was made on the raiders and their retirement was delayed. Thus they were encircled by the wing columns and shortly afterwards the center tank column appeared in sight ready to complete the tale. At this point the "cease fire" ended the day's operations.—*The Army, Navy and Air Force Gazette.*

Summer Training Camp, Camp Knox, Ky.

Quite in keeping with the recent tremendous strides taken by aviation in its possibilities as an offensive arm were the results attained by the Antiaircraft Summer Training Camp recently concluded at Camp Knox, Kentucky.

This camp was unique in many ways. In the first place, it consisted of what was probably the largest group of antiaircraft artillery officers ever assembled in one camp in peace time—approximately one hundred and thirty-five being in attendance. The territory from which these officers were drawn was also remarkable, covering three Corps Areas or about one third of the entire continental United States, extending from West Virginia to Arkansas, and from Minnesota to Kentucky.

This concentration of officers was made necessary by the fact that at no central point other than Camp Knox could a safe artillery range of sufficient length to accomodate high shrapnel bursts be secured. A record in camp attendance of the officers ordered to report is also believed to have been made at this camp. The Fifth Corps Area reported 100% strong, the Seventh Corps Area was short

one man out of a total of 41 ordered, and the Sixth Corps Area had 52 officers present out of a total ordered only slightly greater.

This indicates, in no uncertain way, that the Reserve Officers of this highly specialized arm at least are taking their commissions and their work seriously and are determined to make the most of the opportunities afforded them to gain practical knowledge of their weapons, which bid fair to be so necessary to our security in any great future conflict.

The interest an enthusiasm displayed by the entire group in all phases of their work was noteworthy. Not a single unauthorized absentee from any formation was ever discovered, and no case where discipline had to be enforced ever arose. Although only two half-day periods were devoted to pistol instruction and record practice, fifty-one per cent of all officers firing qualified as marksmen or better.

But if the camp was exceptional in other ways, it was in its own peculiar line, that is, in firing antiaircraft weapons, especially guns, that it rose to greatest heights of excellence. The Reserve Officers present were divided into two distinct batteries, functioning alternately as Gun and Machine-Gun Batteries, one battery consisting of the officers from the Sixth Corps Area, the other, slightly larger, composed of the officers from the Fifth and Seventh Corps Areas combined.

Each battery began to function as such on the second day of the camp; on the third and fourth days trial and adjustment shots were fired, and immediately each battery took up regular record firing at towed targets, completing two record practices with both guns and machine guns for each battery in the final week of camp. The reports of all four of the gun practices were concluded by the significant words "Target Shot Down." To anyone who realizes what it means to accomplish this feat four times out of a possible four, no other remark is necessary. It was not, however, done by chance or accident, but by hard work and application.

Reserve Officers filled every position both in the range sections and on the guns. As was stressed by the Camp Commander in his address at the opening of camp, practical work was the keynote of the camp, and small time was devoted to those theoretical subjects capable of being learned at home by correspondence courses.

The Regular Army personnel on duty at the camp consisted of the following:

Lt. Col. J. R. Musgrave, C. A. C.	Camp Commander
Major L. L. Pendleton, C. A. C.	Camp Executive
Major C. L. Williams, C. A. C.	Instructor
Major A. H. Doig, C. A. C.	Instructor
Capt. D. M. Cole, C. A. C.	Instructor
1st Lt. L. W. Jefferson, C. A. C.	Instructor
1st Lt. V. W. Wortman, C. A. C.	Instructor

Capt. John T. Lewis and eight enlisted men, 62d CA (AA), Fort Totten, N. Y., constituted a small training cadre familiar with every phase of antiaircraft work, and it is to their presence and untiring efforts that much of the success of the camp is due. The cooperation of the Air Corps in flying and target towing also left nothing to be desired.

Retired Officers as Members of the Officers Reserve Corps

The following policies have been announced for the information and guidance of all concerned:

a. No retired commissioned officer of the Regular Army will be appointed in the Officers' Reserve Corps in any grade below that of General Officer.

b. No Reserve Officer below the grade of General Officer who is a retired commissioned officer of the Regular Army will be reappointed in the Officers' Reserve Corps upon the termination of his present appointment.

c. No Reserve Officer who is a retired commissioned officer of the Regular Army will be ordered to active duty under his Reserve commission.—[Letter A. G. O. 210.85 (5-8-27) Res. A. dated Sept. 3, 1927.]

Certificate for Promotion

Under existing regulations and policies of the War Department governing the Officers' Reserve Corps, a Reserve officer must undergo the written examination and practical test prescribed by regulations to secure a certificate of capacity for promotion. Such certificate is not issued based on the fact that an officer has to his credit a total of 300 credit hours.

However, at such time as he has earned a total af 300 credit hours he may apply for promotion to the next higher grade when he has become eligible, in point of service, for promotion. Such application for promotion should be made through military channels and a statement as to vacancy to which he may be assigned in the event of promotion should be included in the recommendations.

Should he desire to secure a certificate of capacity, application for the written examination should be made to his Commanding Officer or Executive Officer and the questions for same prepated by an officer designated for such. Upon the successful completion of same, application then may be made . . . for the practical test.—(4th Ind., Hq. 3d C. A., Sept. 27, 1927.)

A certificate of capacity for promotion qualifies the holder for promotion until such time as it is effected.—(Par. 2, 8th Ind., Hq. 3d Corps Area, September 28, 1927.)

Germany in Oil War

Germany's entrance into the world oil war is set for Thursday, September 13.

On that day the German railroads will begin transporting artificial oil and benzine made by a secret process of breaking down lignite coal.

This revolutionary invention, the Germans claim, eventually will place the country on a par with the natural oil producing nations.

The Standard Oil and Shell groups' efforts to make a deal with the German chemical trust, whereby Germany's production of artificial benzine would be postponed two years have failed.

However, the Standard Oil and Shell will become large owners of stock in the Motalin Co., which is handling the synthetic products.

It is proposed to sell artificial benzine considerably below the European market's prices for natural benzine, and perhaps drive the American and British competition out.

Although the greatest secrecy attends the manufacture of the new benzine, preparations to increase production on a vast scale are being made.

Contacts have been received for 120,000 tons and it is expected to manufacture 300,000 tons the first year.—*Cleveland Plain Dealer.*

Machine Age in Road Building

Road building is now an international industry. America started the movement with its unprecedented use of automobiles. It devised machinery which made it easy to build a hundred miles of road, where formerly it was a task to build one mile.

The giant caterpillar tractors, graders, steam shovels, and trucks move road material with such speed and ease that they make the efforts of the hordes of men required to build the Roman roads look puny by comparison.

Canada is following the lead of the United States in road building. A newspaper advertisement published by the Province of Ontario Department of Highways, says:

"Don't apologize for Ontario's roads. The day is past when they do not compare with those of any other province or state. Road building to carry modern traffic, is a new science. It was in Ontario that the practice of putting on gravel or crushed stone in thin layers was first proven to be more economical as well as more safe to traffic. 'Feeding the road,' it was called.

"Ontario developed the asphaltic mixed macadam which is a hot asphalt mixed with gravel or crushed stone. In ten minutes after being laid, it is hard enough for traffic. Detours are not necessary while this construction is being put down.

"In building the highways, every consideration has been given to the safety of those who use them. The greatest factor of safety now lies in automobile drivers themselves . . . See that your brakes, lights, and steering gear are in good condition . . . Practice caution at spots where danger may arise. Watch warning signs for crossroads, railroads, or other danger. Be careful in villages or where pedestrians are using the roads. Be courteous in traffic."—*Industrial News Bureau.*

Unloading 18-Pdr. Smoke Shell Filled With Phosphorus

By COLONEL DR. MICHAEL KOSTEVITCH

1. Unbox and examine rounds to see that they are in good condition and that there are no signs of P (phosphorous) on outside of shell.

2. Remove cartridge case from round by means of special lever. Empty propellant from cartridge case (C. C.) and send same to burning ground (B. G.)

3. Remove primer from c. c. and send primer to be broken down as per special rules.

4. Send shell to another special shed to be broken down. Under no cicumstances will shells be unfuzed in the shed where c. c. are removed.

5. Remove grub screw holding fuze to shell as per special rules.

6. Place shell in vice and unscrew fuze or fuze and gaine by means of fuze key, except the last two threads. Loosen shell in vice and complete the removal of fuze by hand. Defuzing must be done from outside of the cubicle. Send fuzes and gaines for breaking down to another special shed.

7. Refix shell in vice and remove exploder container by means of a special tool (from outside of the cubicle), except the last two threads. Loosen shell in vice and complete the removal of container by hand. Place exploder container in tin-lined box. Send container to special shop for breaking down process.

NOTE: The reason for completing removal of fuze and container (last two threads) by hand is that should the operators notice any sign of smoke coming from shell or component they can immediately plunge the shell or component into water. A bucket of water must always be kept as near to operator as possible.

8. Remove the shell from vice and extract P. container by using a piece of hard wood, square tapered. These containers are usually very easily withdrawn, but if they do not come out easily, place the shell in a small tank of hot water to soften wax around container. The water from this tank should be poured into a hole in the B. G. and covered over with earth or sand after the day's work is finished. Place P. containers in tin-lined box containing water, and send to B. G. for destruction.

9. The destruction can be carried out by placing the P. containers on the ground and starting a fire by puncturing one or two containers with a sharp blow from a pointed special tool.

10. The piece of ground on which the P. is burnt must be situated as far away from the usual burning patch as possible, and no propellant of *any kind* must be placed on the ground for burning P.

SPECIAL PRECAUTIONS

a. Where the number of P. filled shells is not large, the stocks should be worked off as soon as possible and the buildings used thoroughly cleaned up. If the only shells of this class available are small numbers found among the high explosives, they should be collected until there is a day's work.

b. P. filled shell, which may easily be distinguished by the body, which is painted green, should not be broken down in the same shop as H. E. or shrapnel, and tools used on P. shells should not be used for any other class of ammunition until they have been thoroughly cleaned. During this breaking down process the tools should be dipped in water as often as possible.

c. All components should be kept away from components recovered from other ammunition until they are passed as scrap (Inspection).

d. P. burns on exposure to the air and therefore great caution should be exercised to prevent fire. Buckets of water should always be kept handy and any shell or component from which an escape of smoke or flame is noticed should immediately be totally immersed.

e. Operations on P. shells should be carried out in a small open-fronted shed as far away as possible from other buildings. The cubicles for removing fuzes (degaining) and containers must have no traces of wood (construction of cubicles). The wooden benches and tables should be covered by zinc and be fire-proof.

f. One shell must be completely finished by the operator before operations on another shell are commenced by that operator.

g. The ground around the shed must be watered as often as possible and have the soil disturbed or forked over before leaving off work.

h. As previously stated, removing fuzes and containers must be done in a quite separate place (cubicles) from other processes. The construction of cubicles (different for different shells and according to calculations for each case; made by Chief Safety Inspector) to be verified by Danger Building Officer in each case before the work will start. The distance between Defuzing Shop and any other place where the work of any kind may be carried on to be at least 50 meters.

i. Decasing must be done in quite separate place from any other process and at least 100 meters distant.

j. The stock of shells awaiting B. D. process to be at least 50 meters from the shop in which P. is extracted. It is only allowed for one shell to be in hand at a time per workman and the next shell awaiting to be broken down must be at least 25 feet.

k. The stock of P. containers kept submerged in water to be located at least 50 meters from B. D. Shop and ony other building or shed and 250 meters from any other ammunition on the field, being surrounded by artificial mounds.

l. Before commencing the day's work, before the dinner hour, before resuming work after dinner, and before ceasing the day's work, all benches, tables, and appliances made of wood or metal must be thoroughly washed, scrubbed, and again washed, using plenty of water, and oil residues must be kept submerged in buckets of water.

m. No person allowed in cubicle when plugs or containers are being extracted.

TOOL LIST

In addition to the tools as authorized for breaking down English 4.5-inch H. E. shells, the following will be allowed: square tapered wooden drifts; buckets for water (no fire buckets), tin-lined boxes, buckets for sand (no sand buckets against fire), and shovels.

EXPLOSIVES LIMITS

Number of shells awaiting breaking down (stock)	200
Number of shells in shed broken down at a time per workman	2
Number of phosphorous containers in tin-lined box filled with water and covered by lid (beside each worker)	5
(NOTE: Box can be removed from shed and containers transferred to a bigger box if necessary.)	
Number of fuzes and gaines in shed	100

MAN LIMIT

In cubicle at any one time	2
In other places, will depend on local conditions and is to be fixed up by Chief Safety Inspector.	

Artillery in the Offensive

The May-June, 1927 issue of the *Military Scientific and Technical Reports*, published under auspices of the Austrian Federal Ministry for Army Affairs, contains an article by Major Dr. Rendulic, of the Austrian military service, in which he gives an outline review of and comments on the work of general J. Roger, of the French army, under the above-named title. This book was first published in 1925 but has, it appears, more recently made its appearance in "a greatly improved second edition of 525 pages with 17 sketches and four appendices." Of this work Dr. Rendulic writes:

"The French general Roger, who was artillery director of several divisions and sous-chef of the staff of an army corps in the world war, has set forth his experiences in a book that must be counted among the most interesting contributions to tactical literature. He confines himself almost exclusively to treatment of artillery in the attack although he also endeavors to throw light upon the development of the fundamental principles of the application of artillery generally

and to trace back to formulas of a general nature. We limit ourselves in this discussion to the former subject.

"Taken at large there are two phases of artillery use shown in the World War. The first is based upon preparations for success in destruction of materiel sought by the artillery. Support of the attack was an activity wholly apart from this preparation. In the second phase the artillery's first objective was moral effect. Preparation for and support of the attack can now be no longer regarded as clearly separate actions.

"The destructive activities of the first phase were directed aganst the equipments of enemy batteries, covers (ditches, fighting arrangements, shelters), and against obstructions. The purpose sought to be attained was, in this, almost wholly one of materiel. The preparation was characterized by its long duration—several days. General Roger now endeavors to seek a solution to the question of what results could be expected from this method of preparation and what were actually achieved. In the battle of the Somme the artillery of one division lost, in fighting continued day and night through more than fifteen weeks, only four out of their 84 to 120 field pieces by enemy fire, a loss that falls far below expected measure, especially when one considers severity and duration of the fighting. Special mention is made of one battery against which the enemy directed 21-cm. mortar fire under air observation for a prolonged period and had to his credit one overturned gun. One group of light artillery that was subjected to enemy fire of 15-cm. howitzers for a whole month lost not a single gun. Losses of materiel were no greater in the battle of the Aisne than in those of the Somme. After an examination of the causes of these manifestations the author reaches the conclusion that the success toward destruction of equipment or materiel of enemy batteries can be accomplished only very imperfectly in the modern battle and that the measure of success that can be attained can be neither calculated nor safely estimated but that, notwithstanding this, success in destruction must always be sought for—even though it may not be the main purpose.

"These experiences of the French coincide, in general with our own [Austrian]. In the artillery major combats on the Isonzo (10th and 11th battles, 1917) loss of artillery implements and equipment due to enemy fire were usually very slight, even though the conditions for camouflage of our batteries were, in the Karst, the most unfavorable possible and enemy artillery was greatly superior in number of guns and quantities of ammunition. *At any rate the loss and damage to guns caused by overstraining in use was a dozen times greater than that due to enemy fire.*

"With reference to artillery effect against covers and fighting emplacements the author asserts that a large portion of the trenches and many dugout shelters did not survive the preparatory attacks but that, considering the great extension in depth and laterally of the area fought over, many of them remained undisturbed. Much of this was due to excellent camouflage. The preparations based solely on materiel destruction were kept up in part to the very end of the war, notwithstanding all of these experiences. For example: an order of October 5, 1918, given to a division for attack against the Hindenburg line on October 6, required the destruction by the artillery of all shelters, emplacements, villages, and trenches of that line on a front 4 kilometers wide and 3 kilometers deep. Six large shelters with their attached fighting emplacements, numerous concrete saps, and casemates for machine guns remained wholly untouched by this fire. The effects of fire

against obstructions were similar. As a rule only narrow strips could be covered by fire, and these the enemy succeeded in restoring after a brief breathing spell. The attacking infantry, expecting a clear gangway, was deceived.

"The demand for thorough destruction was the cause of prolonged preparation that required several days in the first place. While official regulations anticipated from 1 to 6 days for such preparations, no major attacks were made on part of the French up to July, 1918, without at least from 3 to 4 days preparation. Weather and meteorological conditions frequently caused delays. Artillery attacks on sector le Forest at the battle of the Somme were delayed by preparations from August 19 to September 3.

"The most important consequences of these prolonged periods of preparation were the impossibility of strategic and tactical surprises and resulting difficulties for the attack. These prolonged preparations had, furthermore, only slight moral effect aside from the comparatively small material results. The author believes that there is promise of success in harassing fire that may embarrass the enemy in his movements and freedom of other activities and have an effect on his morale but only when such fire is incessant and carried on with great intensity.

"The problem of assisting or supporting the attack that devolved upon the artillery consisted in fighting the infantry and artillery of the defender and was divided into two parts: into the *tir d'accompagnement* and *tir de protection*. The most important part of the first is the rolling (wave) fire. It was applied the first time in the 1916 Somme battles. General Roger's judgment of it is annihilating condemnation. The expectation that even a small portion of the enemy would be put out of action by it proved to be wholly fallacious. The slight density and depth of the fire, the fact that the defender sees it approaching and knows that he will be exposed to it only a short time, deprive the rolling fire of all moral effect. The large number of batteries required, the difficulty of tracing accurately the rapidity of the progress of the fire, which is affected by difficulties of the terrain, all tend to impede its efficient application. Numerous circumstances, finally, bring about a local separation between the attacking infantry and the roll of fire and reduce to a still greater extent its value. The *tir de ratisage* (grazing—scraping fire) is expected to supplement the roll of fire in depth to at least 100 meters. General Roger describes that fire as an optical illusion because its effect, taking into account the areas assigned to it, would require more batteries than are available for the rolling fire itself. The methods of accompanying fire, as shown by sketches, he designates a dispersion of force.

"The most important problem of supporting or protecting fire lies, aside from fighting enemy observation, in isolation of the area of attack by means of barrage fire. Barrage fire became, to a certain extent, dogma from the end of the battles of the Somme in 1916 to the armistice. This was really an imitation of the Germans who had placed barrage fire as a protection in advance of their forward-moving infantry at Verdun. But they applied their heavy artillery for this for a time and were successful. But when that fire becomes—as with the French—a regular part of the supporting fire it is merely a contributing factor for the dispersion of forces.

"It was the custom from after the battle of the Aisne to hold back harnessed batteries in order to push them forward in quickest possible time into captured terrain. The author declines to approve that measure because preparation for and support of the attack by these batteries is lost and because waste of time is not due to change of positions by the batteries but to observation, arrangement of

the network of communications, and transport of ammunition. A temporary inaction of guns was also caused by placing batteries so far forward that they fire through the infantry only after gaining considerable advance into the depth of the zone of penetration.

"Summarizing the assisting or supporting problems of the artillery alluded to we have, within the framework of the division, in a breadth of the fighting sector of two kilometers, requirements of artillery grouped as follows (1 group being equal to 3 batteries):

1. Rolling fire	8 to 10 or more groups
2. Tir ratisage	8 to 10 groups
3. Protecting fire	6 to 10 groups
4. Forward batteries	2 to 3 groups
5. Harnessed batteries	2 to 3 groups
6. For creating screens for tank positions	2 to 3 or more batteries
A total of 28 to 39 groups	at least 84 to 117 batteries.

"Available means to meet such needs will hardly ever be at hand. The dispersion incident to such an arrangement would divert the artillery from its principal work: that of fighting the safely established and dangerous enemy.

"The following innovations in the employment of artillery that were introduced gradually during the war are of greatest importance: reduction of methods of preparing for fire that made range finding unnecessary; increasing the achievement possibilities of guns which is given expression by the mass of ammunition expended in a given time unit; application of reduced charges for field guns; arrangement of heavy howitzers for rapid fire; bringing in trench artillery; use of gas; application of power motor vehicles for supplying ammunition.

"Following the employment of these fundamentals, artillery fighting achieved surprising, combined, and frequently renewed mass fire of short duration without prolonged range finding of the separate batteries, and also widely extended use of gas projectiles. The material success was fully equal to that of the usual well-observed accurate fire but the moral effect was incomparably greater. Not only outbreaks of fire repeated at irregular intervals but especially the experience that every instance or resumption of fire activity was followed by an instantaneous new fire attack, had a depressing effect on enemy batteries which was further promoted by extended fire. This proceeding required only a short time and complete suppression of enemy artillery was usually attained by a preparatory fire of a few hours.

"In fighting infantry it was also shown that surprising, frequently repeated, and combined mass fire attained an annihilating moral effect even without accomplishing a destruction of fight emplacements and covers. While the infantryman let the roll of fire pass over him and served his machine-gun without appreciable moral detriment, he did not, as a rule, risk that with the uncertain expectation of a repetition of the hurricane of fire at the decisive moment. Infantry loses, in such cases, its freedom of action and cannot arrive at proper use of its arms at the moment of surprise by the assaulting attacks.

"But by these activities the artillery found itself confronted by increased difficulties in consequence of the changed fighting methods of the infantry. The fighting power of the infantry that was to be held down was greatly stimulated by the cessation of the activities of countless machine guns; the compact firing

lines were replaced by separated but well combined units of fighting elements grouped in depth.

"The application of combined mass fire of short duration, founded on the struggle for accomplishment of moral effect, is an indication of the change in fundamental principles of the use of artillery fire. The struggle for success in destruction of materiel was upheld in one respect only: the demand for destruction of obstructions was naturally retained. Tanks are available for accomplishing that work: tanks, artillery, and with them the powerfully increased working effect of minenwerfers. According to General Roger's views tanks are not the ideal means for destroying (removing) obstructions. Being carried on in dispersed order the destruction of obstructions is done inadequately for the directly following infantry. Arranged in masses in restricted space the tanks can provide broad gaps but they thereby become an extremely vulnerable target for the artillery; hence such an application of tanks is admissible only when enemy artillery may be considered as wholly excluded. As a rule the gaps made by tanks in attack on fortified positions will be made use of by infantry, without risk of being decimated, only when the tanks have pushed themselves well forward into the enemy's depth zone and have caused confusion and demoralization there. Generally, therefore, the work of shooting gaps into obstructions will continue to devolve upon the artillery and minenwerfers, especially during the initial phases of the attack.

"Artillery preparedness in the shortest time has decisive significance for the character of fighting conduct. It renders possible, above all else, strategic surprise which depends essentially upon the secrecy and rapidity of operations. Inasmuch as the enemy is prevented from making timely counter arrangements it accomplishes the equivalent of numerical superiority. It favors keeping up the equilibrim between adequate working capacity and mobility of the guns, since the attainment of a moral effect does not render the heavy calibers necessary which are demanded for materiel destruction. Mobility of the artillery makes it possible to advance the attack rapidly into the enemy and to reduce the intervals of time between attacks against the many separate objectives. The shortening of time for preparation and mobility of the batteries also makes possible the rapid succession of attacks at different points."—G. R.

Military Attaches

Field Marshal von Ostrymiercz, of the former Austro-Hungarian army, is the author of a very interesting article published in the August 4, 1927, issue of the *Militär-Wochenblatt*, on the duties and obligations of military attachés, a translation of an extract of which is here given.

"The obligation and duties of military attachés and the measures to be taken by them in fulfilling the latter are not the same in all states. It may, however, be stated here in advance, that the first and principal duty of a military attaché, that of spying, as it is usually conceived by and present in the mind of the layman, may be consigned wholly to the domain of fable. In the five years preceding the outbreak of the war, during which communication with the military attachés accredited to Vienna was one of the services placed under my jurisdiction and their direction in the major maneuvers was my special duty, there occurred only two instances, notwithstanding the constantly increasing political tension, for requesting the withdrawal of two attachés of the Russian embassy. Both of

them had, in compliance with instructions given them, actively participated in espionage service. The high-minded and noble aged emperor had most rigidly forbidden the military attachés of the Austro-Hungarian service to engage in espionage and any infringement of this rule on their part would have been visited by severe and drastic punishment. There was no lack of temptations; during the years of the encirclement of the central powers preceding the war many shady elements frequently attempted to attach themselves with provocative intentions to our military attachés accredited to foreign governments. All these approaches were declined and the matters referred to the proper section of the embassy. Based on experience gained in many years service as director of the collector of evidence of the conditons of foreign armies through communication with their general staff bureaus, I am justified in stating that our military attachés, when carrying out their duties of obtaining thorough knowledge of the organization, composition, and dispositions of foreign armies, never had their attention directed to matters that could be construed as espionage service. A professionally trained expert and competent officer possessing a disciplined outlook for military affairs has abundant other means for gaining information about the force factors of a nation. Legalized communication with military central stations, experiences gained in observation of exercises to which he is invited, keeping in touch with and following up information contained in the military press and literature of the day, accurate study of the states economic management, observation and notation of pertinent debates of the legislative bodies, furnish the military attaché with a far more representative outline of a nation's army affairs and the factors that influence their values than would reports of mysterious "men of honor," whose data are frequently very doubtful and misleading.

"The duties of military attachés may be divided into military, political, and economical. In a military political sense he is the professional adviser of his embassy chief. He becomes a very important member of the representative body when the desire for a political alliance of any nature having military cooperation for its aim arises. It then becomes his problem to give professional judgment on the military achievement possibilities of the state under consideration, to give proper direction to the fundamental negotiations, and to secure connection between the central stations of both states at their conclusion. Such a situation is an example of the weighty responsibility of the military attaché. A glance at the history preceding the war teaches, for example, that the policy of the entente was founded on Russia's participation with the powers arrayed against the central powers. It became the duty of the military attaché of France, the carrier of that policy, to establish to a certainty whether or not Russia would be able to fulfill the function of becoming the "steam roller" that had been assigned to it. He failed to give a correct estimate, Russia had to be eliminated from the ranks of the enemies of the central powers before a decision was reached.

"The negotiations concerning England's participation in the war of the entente on the continent, especially of the landing of the English troops in Belgium, were led by the English attaché at Brussels. Placing only 100,000 soldiers in a situation of preparedness proved to be a fateful error. Belgium, including its modern fortifications. was overwhelmed; the English initiative contingent in the world war soon came into a very critical situaton.

"In contrast with this it is an established fact that the Austro-Hungarian attachés at Rome never permitted themselves to gain the impression that Italy, notwithstanding the triple alliance, would fight on the side of Austro-Hungary. Their judgment was discredited by the diplomats until the serious outcome gave evidence of the bitter reality. The extraordinary importance of the station is a sufficiently forceful reason for the careful selection of the personalities proposed for these duties. Neither name, rank, social capabilities, financial independence, nor knowledge of languages must turn the scale, but in reality, only thorough professional knowledge, militarily trained powers of observation, and responsibility for judgments and suggestions advanced should decide.

"The significance of the military attaché in his politico-economical relationship is greatly misapprehended. The military establishment of a state involves innumerable necessities that must, in conformity with the state's status of raw material products, technics, or industry that can either be produced locally or will have to be obtained from foreign parts, be an important subject of investigation. A professionally trained, independently thinking mind will perceive which needs of his own army can be produced and obtained with advantage in a country of whose natural treasures, technique, and industry he has accurate knowledge and also which productions of his own country could, with equal advantage, find application in the armies and navies of a foreign state. Suggestions pertaining to these matters might turn out to be of extraordinary utility to the economic industries of his own country. The skillful initiation of foreign export of war material can today, when needs of war technics and industries coincide with those of so many branches of civil life, be regarded as a very important function of the military attaché."—G. R.

Glory in Rags

In a brief article over the signature "K. von T." [von Taysen (?)], published in the July 11, 1927, issue of the *Militär-Wochenblatt* the writer furnishes and comments on excerpts from *La France Militaire* as follows:

"It is well known that no government can please the Frenchman; even when the weather is bad he abuses the government. This absording passion for criticism, which is above all in the habit of seeking to discharge itself in vivacious temperamental outbursts in novels, cannot be wholly ignored when one reads the novel which the daily edition of the French army newspaper *La France Militaire* has recently presented to its readers under the title "Les Hailons de la Gloire"—(Glory in Tatters). It is written by a former French army officer. But even when, while recognizing what has been above said about French peculiarities, we undertake to make material reductions from the picture presented by this novel of life behind the curtains in the "great family" there remains no doubt much that is real, there remains above all the fact that the journal expected to appeal to the sentiments of its readers by its presentation of alleged conditions in the French army.

"Once Glory, France's glory, newly established by the victorious army, now nothing but rags, want, and misery. The active officer resigns to avoid vegetating in wretchedness which is not even mitigated by the social standing of the class; resigned officers and war invalids palm the most valuable portions of their menage. Troop transports go oversea in steamers in which rags and tatters are not improved by a new coat of paint—there s need everywhere, due to inadequate financial means, In Morocco one is fighting, it is alleged, for the civilizing mission

of France but in fact so that grafters and rascals from all lands may fill their pockets through the departments of supply and transport.

"These and similar allegations are intertwined with treatment of serious human destinies and attempt is made to throw light on the so called concubinage question. It furnishes a profound insight into the social life of the service and private circumstances of the French former war officers corps.

"And finally there arises the question: are the symptoms an accumulation, are conditions actually so, can the shoulders of the French people and army, which must still draw its force from the people, carry the crushing load of this world power?"—G. R.

Maintain American Ideals

That there is growing sentiment in this nation against unnecessarily high taxes, the constant passage of innumerable laws and ordinances, the establishment of new boards, bureaus and commissions and extension of government control over the individual and private business, is evidenced by comment appearing all over the country.

At recent elections the people cast a decided "No" vote against measures which pile up expense or restrict individual activity. Editorial comment on the situation is widespread. It appears in country daily and weekly newspapers, in metropolitan dailies and in magazines of national circulation. Public officials openly express opinions on the subject which would have been deemed political suicide a few years ago. The underlying thought seems to be that there has been a tendency to drift away from our original simple form of government which gave us the spiritual and individual freedom that made possible our enormous material prosperity. Commenting on the situation, *Collier's Magazine* says editorially:

"Not many people believed in the creed written by Thomas Jefferson 151 years ago.

"His principles became the ferment that for good or evil made us what we are.

"The rules of conduct laid down by the idealistic Virginian form a doctrine which cannot be forgotten or ignored. They are simple and but two in number:

"1. All men are created equal and are endowed with inalienable rights to life, liberty, and pursuit of happiness.

"2. Governments derive their just powers from the consent of the governed.

"Brief and plain, but all the libraries of political philosophy could have said nothing more moving. Washington's military talents made it possible to test the truth of Jefferson's principles. The importance of the initiative you show cannot be underestimated, but bigger than any man is the America which liberates every child to go as far as his native talents will carry him.

"A century and a half have demonstrated the worth of freedom to us and to our country."—*Industrial News Bureau.*

Corregidor

By TenEyck van Deusen

Alone, and rising grim and tall,
With your stern face to the sea,
Soft, green, and lovely from afar,
And yet—it seems to me,
'Tis but the green of velvet cloth
Masking the hand of steel,
Ye sit alone and watch, and wait,
And guard through woe and weal.
Deceptive in your beauty
With your deep-voiced, mighty guns,
Swept by the rains and beaten
By a myriad tropic suns—
God knows it! You have held your trust,
And guarded through aeons!

COAST ARTILLERY BOARD NOTES

Communications relating to the development or improvement in methods or materiel for the Coast Artillery will be welcome from any member of the Corps or of the Service at large. These communications, with models or drawings of devices proposed, may be sent direct to the Coast Artillery Board, Fort Monroe, Virginia, and will receive careful consideration. R. S. ABERNETHY, *Colonel, Coast Artillery Corps, President Coast Artillery Board.*

New Projects Received and Initiated During the Month

Project No. 584, Elimination of Powder Charges, Lower Zones, 12-inch Mortars.—Proposition to break up charges for lower zones in those mortar batteries likely to fire at longer ranges only, and to make charges for longer zones from the powder, was submitted for expression of opinion of faculty, Coast Artillery School, and is now undergoing study.

Project No. 585, Revision of Coast Artillery Memorandum No. 7.—Proposed modification of Coast Artillery Memorandum No. 7 to affect target practice for 1928—especially the scoring system—is being checked carefully and studied.

Project No. 586, Standard System of Fire Control.—This project refers to a systematic revision of the present fire control system for

a. Major-caliber guns for both Case II and Case III firing.

b. Rapid-fire batteries for short, mid, and extreme ranges.

c. Comprehensive study, development, and test of fire control devices in connection with *a* and *b*, above.

Project No. 587, Kitchen Equipment of Railway Artillery Units.—This project refers to the kitchen equipment to be supplied to railway artillery units, to meet reasonably-to-be-expected conditions of service and movements.

Project No. 588, Test of Range Correction Board, T-1, No. 1.—This is the first device of the type described in C. A. B. Project No. 425 (Published in the COAST ARTILLERY JOURNAL for March, 1925) of arsenal manufacture. It has been given a service test by the 52d Coast Artillery.

Completed Projects

Project No. 549, Test of Deflection Board, T-1

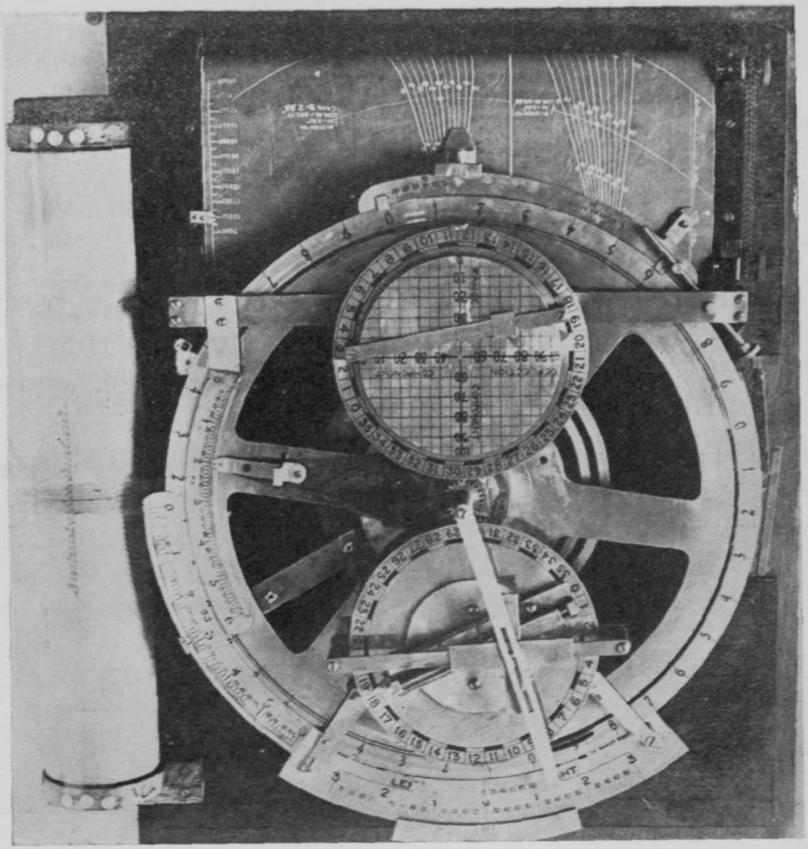
I—HISTORY OF THE PROJECT.

1. Test of Deflection Board, T-1, was directed by letter from the Office of the Chief of Coast Artillery (OCCA 665/AH11), extract from which is quoted below:

> 1. Two models of the above-mentioned apparatus have been shipped from Frankford Arsenal as follows:
>
> 1—To Ordnance Officer, Fort Monroe, Va.
> 1—To Ordnance Officer, Fort Eustis, Va.

2. It is desired that you arrange for the test of these boards by organizations at the stations above indicated during the coming training and target practice season and render report of test to this office.

2. The Deflection Board, T-1, was described in Coast Artillery Board Project No. 87, "Coast Artillery Board Universal Deflection Board," and Project No. 316, "Coast Artillery Board Deflection Board."



II—Discussion.

3. One deflection board was tested by Battery "C," 12th Coast Artillery, and the other by Battery "E," 52d Coast Artillery (Ry). The Battery Commanders' reports of test are as follows:

a. Report of Commanding Officer, Battery "C," 12th Coast Artillery:

1. The Universal Deflection Board was tested by Battery "C," 12th Coast Artillery, in drill at Battery Anderson for a period for three weeks. Testing of the Deflection Board was then abandoned for it was necessary to prepare for the battery's annual target practice and the deflection board did not prove satisfactory for mortar firing.

2. In changing from zone to zone it is necessary to pry up a glass plate to change the drift charts. There was no means of lifting this plate except inserting a knife blade in the crack between the plate and the board and prying up. This delay caused the loss of two or three readings each time the zone was changed. It is suggested that the drift charts be placed on rollers so that the scales can be changed without lifting the glass plate. This will eliminate lost readings.

3. As constructed at present it is mechanically impossible in some zones to set the pointer edge at all of the drift scales in those zones. The sliding portion of the Deflection Board is prevented by the shortness of the slat in which it slides from moving enough to the left. This makes it impossible to correct for all possible combinations of wind and drift in these zones. This must be changed before the board will be satisfactory.

4. The movable pointer on the arbitrary correction scale has proved satisfactory in applying arbitrary corrections. It enables the corrections to be applied as spotted instead of necessitating net corrections to be figured. This takes less time and eliminates a possibility of error.

b. Report of Commanding Officer, Battery "E," 52d Coast Artillery:

1. The new deflection board T-1, No. 1, was given a service test by this battery durng the 1927 target practice season.

2. From a mechanical standpoint the board is very satisfactory, no defects having been found. The slide which holds the Battery Commander's correction scale should be made of metal, or should be sheathed in metal, as during wet weather the movable slide provided swelled and could not be moved. A sheet of zinc or some similar metal should be provided on which to paste the chart. An arrow indicating the direction in which the Battery Commander's adjustment scale should be moved to effect a right or left correction would be desirable. The board under the interpolater should be painted white, as the lines on the interpolator do not show up against the mahogany background provided.

3. For use in a mobile battery, the board has one defect, in that no method is provided for the application of a position or calibration correction. The guns in this battery were not emplaced far enough apart to make such a correction necessary but under service conditions a deflection correction to take care of the difference in position will always be necessary. As this correction will vary with different azimuths, it will not be possible to apply a flat correction at the guns. A variable correction can best be applied in the plotting room, and it is believed that no deflection board can be considered satisfactory for mobile batteries unless it provides for the application of a correction of this type.

4. The cross wind and drift chart sets in a rectangular recess on the surface of the board. The Commanding Officer, Battery "C," 12th Coast Artillery, endeavored to keep the chart flat by laying a piece of glass (cut to fit the recess) over it, with the resultant difficulty stated in Paragraph 2 of the report quoted in Paragraph 3*a*. The attaching of the chart to a sheet of metal as recommended by Commanding Officer, Battery "E," 52d Coast Artillery (Ry), would have overcome the difficulty.

5. A minor modification of the board, without increasing its size will overcome the difficulty stated in Paragraph 3 of the report of the Commanding Officer, Battery "C," 12th Coast Artillery.

6. The Coast Artillery Board concurs in the recommendations of the Commanding Officer, Battery "E," 52d Coast Artillery (Ry), that there should be added an arrow to indicate the direction in which the slide for applying adjust-

ment corrections should be moved, and that the board under the interpolater should be painted white.

7. The Coast Artillery Board knows of no deflection board as yet tested which incorporates means of correcting the azimuth for gun displacement.

8. From the reports of tests quoted, from consultation with officers who have used the Coast Artilery Board Universal Deflection Board in improvised form, and from its own examination and study of this type of deflection board, the Coast Artillery Board is of the opinion that Deflection Board, T-1, possesses the defects noted below:

a. Sticking of slides due to the slides and the surfaces along which they slide being of wood. The board will not be satisfactory for tropical use unless all sliding surfaces be of metal.

b. Delay incident to change of cross wind and drift charts. This can be remedied partially by attaching the charts to sheet metal. A better solution appears to be to place the charts on rollers; this, while feasible, would require a material change in the design of the board.

c. Impossibility of setting maximum corrections required in mortar fire. This can be overcome without difficulty, either by increasing the length of the slot in which the main slide of the board moves, or by moving the chart location and setting pointer of adjustment slide a short distance to the right.

d. The necessity for a long azimuth tape. The use of metal scales is believed preferable, but no means of applying them to the board has been found. The long azimuth tape is inherent to the design of the Board.

e. The necessity for a separate device to determine angular travel for Case II fire. (This device has been reported upon in Coast Artillery Board Project No. 485, "Deflection Computer, T-1.")

9. The Coast Artillery Board has under development a deflection board which will have the following advantages as compared with the Deflection Board, T-1.

a. There are no wooden slides to stick.

b. Cross wind and drift charts are carried on rollers, so that delay due to change of charts is minimized.

c. Metal scales are used.

d. There is incorporated as an integral part of the board a device for the determination of the angular travel of the target during time of flight for Case II fire.

e. There is incorporated as an integral part of the board a device for correcting the azimuth in Case III fire, for gun displacement; the corrected azimuths of setforward point for both the directing gun (or point) and another gun (or point) displaced therefrom can be read.

III—Conclusions.

10. The Coast Artillery Board is of the opinion:

a. That the Deflection Board, T-1, with minor modifications would be more satisfactory than any deflecton board previously considered.

b. That, in view of the apparent superiority of the deflection board under development by the Coast Artillery Board over the Deflection Board, T-1, it is advisable to suspend endeavors to perfect the deflection board, T-1, until after test of the new deflection board.

IV—RECOMMENDATIONS.

11. The Coast Artillery Board recommends that further action toward the adoption of the Deflection Board, T-1, be suspended pending test of the new deflection board now under development by the Coast Artillery Board.

V—ACTION OF THE CHIEF OF COAST ARTILLERY.

1. The recommendation of the Coast Artillery Board, contained in paragraph 11 of Project No. 549, is concurred in.

2. It is requested that, pending the test of the new deflection board proposed, any manufacturing orders that have been issued for ordnance instruments for fire control projects be suspended insofar as they pertain to the supply of deflection boards, T-1.

APHORISME XXXVI

It is hard for a Generall so warily to walk in any condition of charge or service as that hee dash not his foot against the stone of offence: he being chiefe in command, must use his authority sparingly, if he intends to keep it long. Wherefore that Generall which binds not himselfe within the limits of his Commission, nor useth the advice of his Councell of Warre, shall never want secret enemies amongst those hee hath neglected, to urge his transgression, and work his confusion.—Ward's Animadversions of War *(London, 1639)*

BOOK REVIEWS

Genghis Khan. By Harold Lamb. Robert M. McBride & Company, New York. 1927. 5½"x 8½". 270 pp. Ill. $3.50.

A large part of the training of an officer in military leadership comes from a study of the lives of military leaders. The list usually begins with Alexander and includes Cæsar, Hannibal, Gustavus Adolphus, Napoleon, and some of our own generals, particularly those of the Civil War. The more widely read officers also find inspiration in the careers of Xerxes, Turenne, Eugène, Condé, Cromwell, Wellington, Napoleon's marshals, and others of the European leaders; but all acclaim Napoleon the great master. Of no other military leader has so much been written, and with no other have the biographers been so sympathetic. For more than a century his supremacy has been unquestioned.

Now that, in the greatly increased popular interest in biography, no man is too great or too small, too well known or too little known, to escape the searching investigation of the biographer, challenges to Napoleon's right to first place as a leader appear. Other favorites are being brought forth. We are asked to remember that Napoleon abandoned one army in Egypt, lost another in Russia, ended his career at Waterloo, and lived to see his empire fall apart. New light on the life and career of Robert E. Lee places him in the class of the famous Corsican. Scipio Africanus is advanced as "a greater than Napoleon." And now Genghis Khan, the Master of Thrones and Crowns, the Emperor of All Men!

The author has drawn upon the limited sources available and has presented a complete and an intensely interesting account of the career of one of the gigantic figures of history. What little we have known of Genghis Khan has been gleaned from the accounts of his enemies. Unlike Napoleon, he wrote no memoirs, nor did he have scribes to record his every word and his every deed. He devoted all his energy to the expansion and consolidation of his empire, and the extent of his success may be learned from Marco Polo who pictures for us the empire in the time of Kublai Khan.

Son of a minor chieftain of the Gobi, Genghis Khan (born Temujin) succeeded his father at thirteen years of age. Deserted by most of his clan, hunted and harried by rival chieftains, he began his career "with empty hands." Before his death, this barbarian—nomad, hunter, and herdsman—"outgeneraled the powers of three empires," and "made himself master of half the known world." Even more notable was the fact that the empire of Mongols, Chinese, Mohammedans, Christians, and Jews which he built up endured and reached its greatest glory in the reign of his grandson, Kublai Khan.

Continued and overwhelming victories, such as those of Genghis Khan, have always been marked by superior strategy and have usually been accompanied by an important development in battlefield tactics; and both appear to have been important in the establishment of Mongol domination. Numbers alone do not account for the successes of the Mongols, for they were frequently outnumbered; but they were masters of stratagem, they were excellently mounted, they were apt students of warfare, and they were devoted to the Khan. When we add to these advantages their loose battle formation in considerable depth, their predilec-

tion for enveloping or flanking attacks, their skillful use of reserves, their rapidity of movement, and their rigorous discipline, both on and off the battlefield, we can understand why the Mongols seemed to their enemies to be invincible.

Although Genghis Khan, like Cæsar, was great as orator, politician, administrator, and military leader, warfare predominated in his life and his biography is essentially military. He spent the greater part of fifty years in the saddle and he died while engaged in a campaign. Mr. Lamb has not particularly emphasized the military side of the Great Khan's career, but in this very readable book he has prepared a biography in which an Army officer will find both entertainment and profit.

Cannibal Nights. By Captain H. E. Raabe. Payson & Clarke, Ltd. 1927. 5½"x 8". 324 pp. Ill. $3.00.

Many years ago Herman Melville began it—this describing life in the beautiful, dangerous isles of the South Seas; but the readers who appreciated the adventures of that gallant sailor were comparatively few. Not until the writers of our own generation—O'Brien, Hall, Nordhoff, and others—gave to the world their interpretation of the lure of the South Seas did the imagination of the public become kindled and books on the South Seas begin to be listed among the best sellers. Within the past few years many books have appeared dealing with the various phases of the Southern Island life—some of them really creditable productions, others absolutely unreliable as to facts and of no literary value whatever.

Cannibal Nights is one of the latest additions to this literature of the South Seas, and deals with the Solomon Islands in the 70's and the 80's, when few ships entered those dangerous waters, the savages were unfriendly and treacherous, the famous Bullies preyed upon more lawful trading ships, and the Malay pirates were a constant menace to navigation.

The author, Captain Raabe, was a pioneer trader of the Coral Sea, and his most romantic and adventurous career is related in *Cannibal Nights.* At thirteen years of age he ran away from school and shipped before the mast on the clipper *Dolphin.* While on shore leave at Sydney he was shanghaied on board the *Emma P.*, a free trader, and later became mate of that bark. After many adventurous voyages to the Solomon Islands in the *Emma P.*, he shipped as mate on the trading schooner *Ontong,* which was captured by Malay pirates and promptly re-taken by one of Bully Hayes' ships, Captain Raabe and the supercargo, Hall, being the only survivors of the crew of the *Ontong.*

Taking service under Bully Hayes, free lance trader and blackbirder, Captain Raabe "recruited" black labor for the mines and plantations of Australia and New Zealand until he became master of his own trader, the *Glenora,* in which he made many profitable voyages.

Today, Captain Raabe, retired from the sea, is a marine surveyor, living in Jersey City. But the South Seas of a generation ago lives vividly in his memory, and *Cannibal Nights* is a series of pictures of the life of those stirring days when the free traders defied every law, and human life was held of little account. Many of the descriptions are strikingly vivid—the cannibal feasts, the fights between the crews of rival free traders, life on the lonely islands controlled by Bully Hayes and his bands of lawless followers, the white squall, that most dreaded of ocean storms—it all makes colorful reading and has the ring of truth. One cannot help but wish, however, that the beautiful Catherine were omitted—she

strikes the one forced note, and calls to mind Jack London's *Sea Wolf*, when a rattling good sea yarn was spoiled by the introduction of a feminine character into the last chapters. Catherine may have been a real person, but she does not fit into the pictures of piracy, murder, cannibalism, and sudden death of various kinds that fill *Cannibal Nights*. In spite of Catherine, however, the book must recommend itself to every lover of adventurous stories of sea life.—E. L. B.

Book Reviewing. By Wayne Gard. Alfred A. Knopf, New York. 1927. 5″x 7½″. 159 pp. $2.00.

With an ever-increasing output of books in this country, book reviewing has become a necessity to the reading public. The average reader, unable himself to take time to examine all books published, must depend upon the book reviewer for assistance in selecting the works likely to be interesting. Unfortunately, "the rate of payment for reviewing remains lower than the return for most other kinds of writing," and qualified reviewers are not so numerous as might be desirable.

For the purpose of "raising the level of book reviews," Mr. Gard has prepared this volume, *Book Revewing*. The work is highly condensed, but the author finds space to discuss the subject both from the viewpoint of the reviewer and from that of the editor. A valuable chapter furnishes sixty pages of examples of reviews by such well-known writers as Sherwood Anderson, Harriet Monroe, Gamaliel Bradford, H. L. Mencken, and John Bakeless. Another chapter of interest to reviewers indicates possible markets for reviews. Free lance reviewers and students in journalism will find this a valuable book.

The Writer's Handbook. By W. F. Bryan, Arthur H. Nethercot, and Bernard de Voto. The MacMillian Company, New York. 1927. 5″x 7″. 238 pp. $1.10.

The authors of *The Writer's Handbook*, who are members of the Department of English at Northwestern University, have made use of their experience in teaching to prepare this "empirical and pragmatical text book of composition." Their basis of authority is, in general, the practice of the best contemporary writers and the style cards of the best contemporary periodicals and publishing houses.

The book starts with the composition as a whole, passes to the paragraph, and then concentrates upon the sentence. The rules of grammar and the mechanical details of punctuation, capitalization, spelling, annotation, etc., are taken up last. This arrangement, progressing from the general to the particular, is logical and should result in the elimination of errors in the order of their importance.

Where usage varies, the authors give the more common practice, as in the position of periods at the end of quotations; and where current usage shows a definite trend away from the old rules, they are tolerant—which is perhaps another way of saying they are up-to-date. Although intended for classroom use the book is well worth a place on any young writer's desk.

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